NSN 0056-00-472-3000

INSTRUCTION BOOK

M200
MATRIX PRINTER

(USER'S GUIDE)

PART OF

FLIGHT SERVICE AUTOMATION SYSTEM

VOLUME I

CONTRACT DTFA01-81-C-10039

CONTRACTOR

E-SYSTEMS, INC.
GARLAND DIVISION
P.O. BOX 660023

416-21627

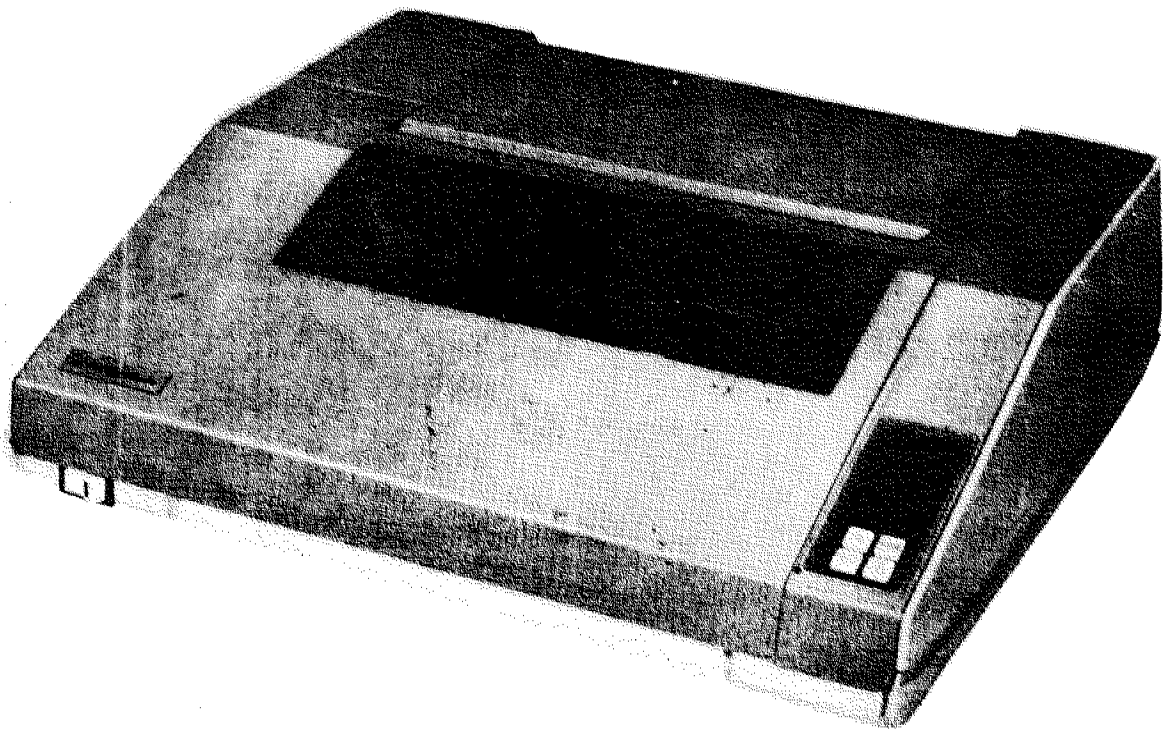
1 MAY 1985

MADE FOR

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

TI 6490.20

M120/M200
MATRIX PRINTERS



USER'S GUIDE

Dataproducts Corporation grants the Federal Aviation Administration specific limited rights as provided for in General Provision 42. Rights In Technical Data and Computer Software, paragraph B., entitled "Governments Rights." These limited rights (including the right to duplicate) are applicable to all Maintenance and Operation Manuals for the Dataproducts B series equipment provided under this Contract DTFA01-81-C-10039. Use of this data is specifically for the FSAS project only.

TI 6490.20

M120/M200 MATRIX PRINTERS USER'S GUIDE

DPC255174B

Dataproducts

6200 CANOGA AVENUE
WOODLAND HILLS, CALIFORNIA 91365

GENERAL DESCRIPTION

PREPARATION FOR USE

OPERATOR INSTRUCTIONS

PRINTER INTERFACING

CONTROL CODES/ ASCII CODES

OPTIONS

PRINTER DIAGNOSTICS

NOVEMBER 1981

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. As temporarily permitted by regulation it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient the receiving antenna.
2. Relocate the printer away from the receiver.
3. Move the printer away from the receiver.
4. Plug the receiver into a different outlet so that printer and receiver are on different branch circuits.
5. Consult an experienced radio/TV technician for additonal suggestions.

CAUTION: To avoid the possiblility of a shock hazard, fire, or violation of your equipment warranty, any INTERNAL modifications of your equipment should be done ONLY by a qualified service representative.

NOTE: Due to connector pin impedances an unshielded plug or cable may cause radiation interference. The printer is designed for use with an adequately shielded interface cable. The shield must be bonded directly to the chassis of the printer.

TABLE OF CONTENTS

TABLE OF CONTENTS (Contd)

LIST OF ILLUSTRATIONS

LIST OF TABLES

SECTION I

GENERAL DESCRIPTION

1.1 INTRODUCTION

This User's Guide describes the Dataproducts M-Series (M120/M200) family of matrix printers, hereafter referred to as the printer. The manual consists of the following sections:

Section I	-	General Description
Section II	-	Preparation for Use
Section III	-	Operator Instructions
Section IV	-	Printer Interfacing
Section V	-	Control Codes and ASCII Codes
Section VI	-	Options
Section VII	-	Printer Diagnostics

1.2 PURPOSE OF EQUIPMENT

The M-Series is a family of microprocessor-controlled matrix printers designed for use as output peripherals for minicomputer terminals and small business systems. Data is supplied by the user in either parallel or serial form, and printed bidirectionally. Characters are formed in a 7 x 7 dot matrix. The dots are produced by print wires striking an inked ribbon against the paper form.

1.3 DIFFERENCES BETWEEN MODELS

Two models of the M-Series printer family are described in the User's Guide:

a. Model M120 Medium Speed Serial Matrix Printer.

b. Model M200 High Speed Serial Matrix Printer.

As the names imply, the principal difference between the two models is the print rate. Where the Model M120 printer prints at a nominal rate of 75 lines/minute for 132 printed character columns, the Model M200 print rate is 125 lines/minute for 132 printed character columns. To this end, the M120 printer uses a single-column print head of seven print wires; the M200 printer uses a dual-column print head of seven print wires each, for a total of 14 print wires. Other differences include hardware circuits that drive the print wires, shuttle servo motor, and firmware routines involved in printing.

Throughout this User's Guide, the paragraph, figure, and table headings that apply uniquely to either the M120 or M200 printer are designated by the applicable model number. Headings not designated by a specific model number apply to both models.

1.4 FEATURES

1.4.1 Standard Features

Following is a list of M120/200 standard features.

a. Front Forms Load
b. Bottom Forms Load
c. Horizontal Alignment Guide
d. Vertical Alignment Guide
e. Easy Loading Ribbon Cassette
f. Paper Out Sensor
g. Condensed Printing
h. Expanded Printing
i. High Speed Paper Slew
j. Forms Thickness Control
k. Status Display
l. Built-In Self Test
m. 6 Lines Per Inch Print Lines

1.4.2 Optional Features

Following is a list of M120/200 optional features.

a. Rear Forms Load
b. TCVFU/DAVFU
c. Variable Forms Length Select Switch
d. 6/8 Lines Per Inch Switch
e. Condensed Print Switch
f. Long-Line Parallel Interface
g. Serial Interface
h. DPC Centronics-Compatible Interface

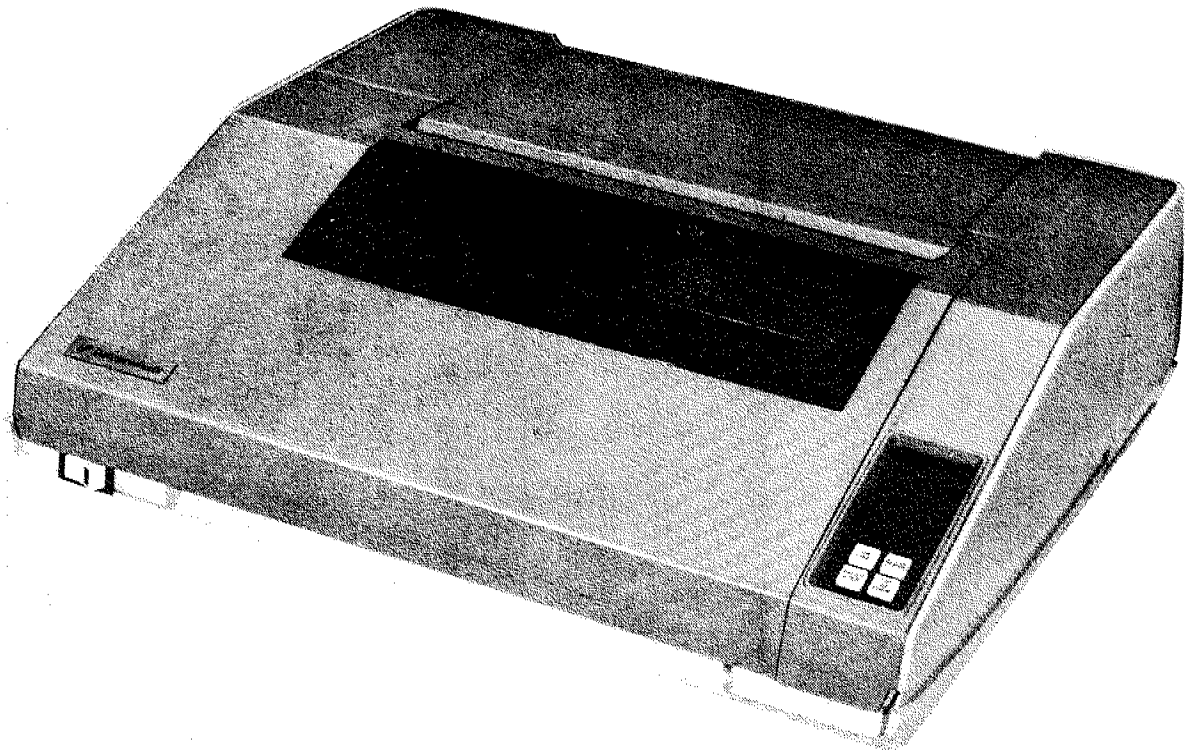
Information on these optional features is provided in section VI (Options).

1.5 PHYSICAL DESCRIPTION (Figures 1-1 through 1-4)

The printer is made up of seven major physical components, as follows:

a. Print Head
b. Shuttle System
c. Ribbon System
d. Paper Feed System
e. Power Supply
f. Control Panel
g. Circuit Card Assemblies

These components are enclosed in a clamshell plastic package, and mounted on the bottom half of the package. The two halves of the clamshell package are locked at the back by two quick-release latches, and secured at the front by two recessed screws. To gain access to all components of the printer, the top portion of the clamshell package, the top cover, is removed. The control panel is housed within the front right of the top cover, and fastened by a spring-loaded



2451222-151

Figure 1-1. M-Series Printer

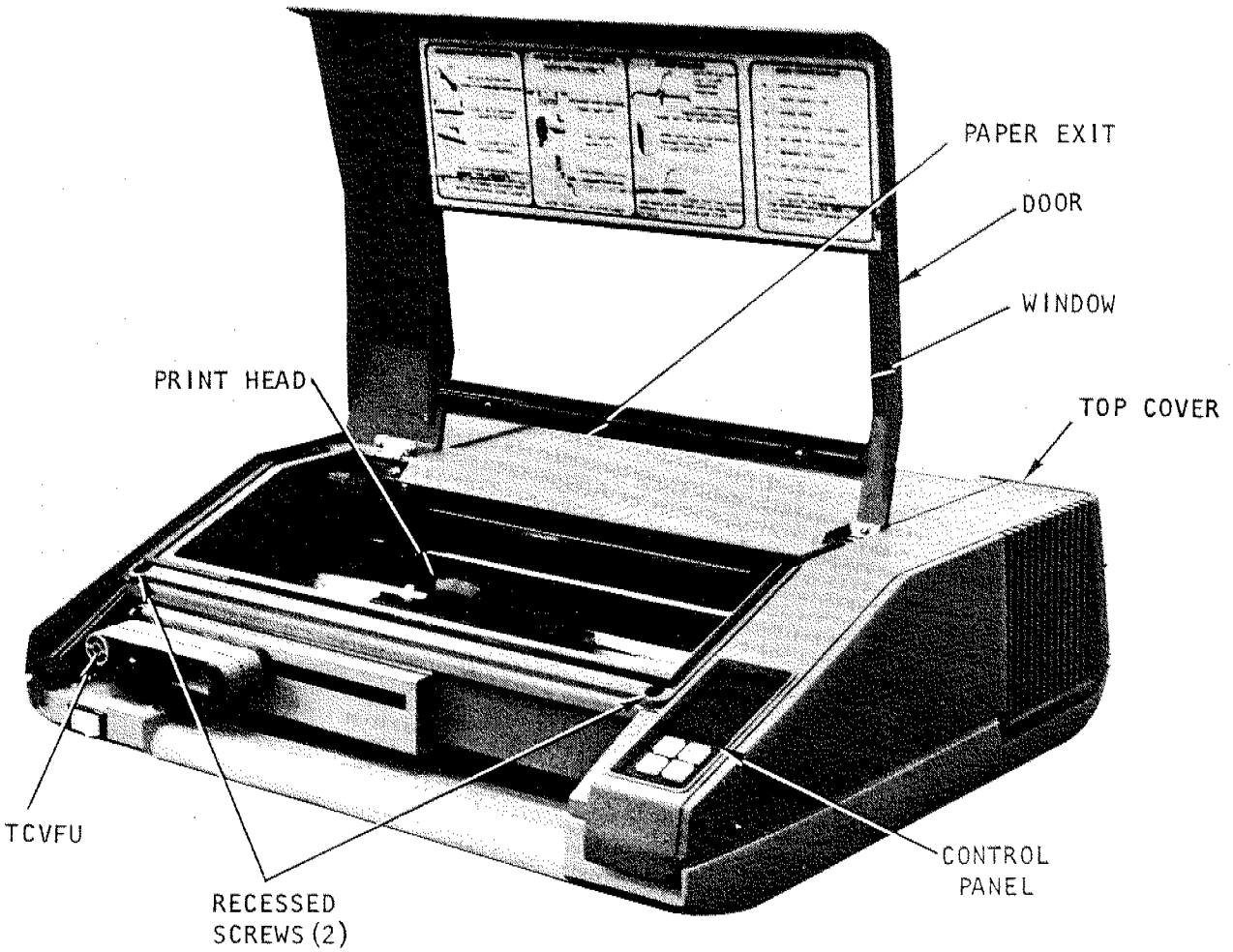


Figure 1-2. Printer, 3/4 View, Window Raised

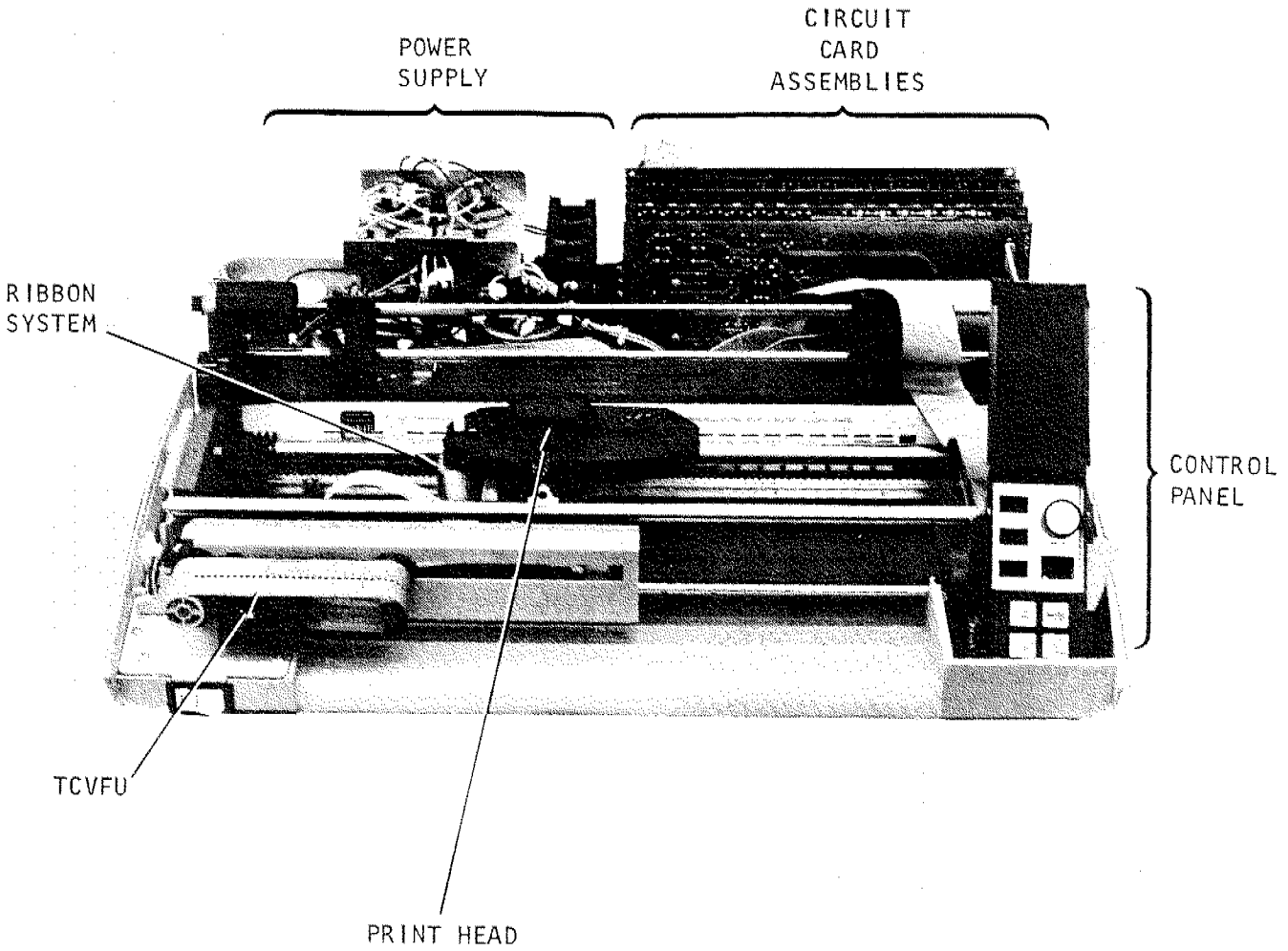
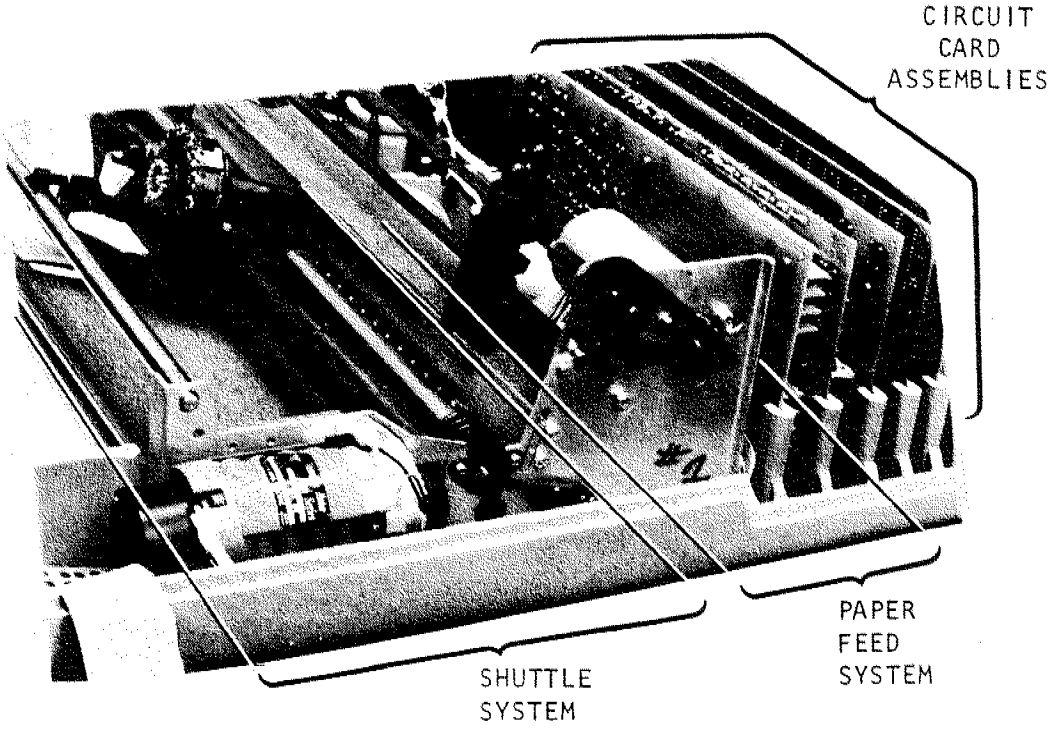


Figure 1-3. Printer Front View, Cover Removed



345122 145

Figure 1-4. Printer Right Side View, Cover Removed

clip. When removing the top cover, the control panel is detached and placed in a recessed area within the printer chassis. A hinged portion of the top cover, the door, is raised as shown in figure 1-2 to gain access to the print head and ribbon cassette. A plastic window within the door allows for viewing the line currently being printed while the door is closed. Paper exits at the top through a slot within the top cover.

1.6 M200 PRINT HEAD

The M200 printer uses a 14-wire head to produce dot pattern characters (matrix). The fourteen print wires are arranged in two vertical columns of seven wires each. Figure 1-5 illustrates the dot configuration of the character "M" within the matrix.

1.7 M120 PRINT HEAD

The M120 printer uses a seven-wire, single-column print head to produce the dot pattern characters. In all other respects, the printing principles of the M120 are identical to those of the M200 described in paragraph 1.6. Figure 1-6 illustrates the dot configuration of the character "M" in the M120 printer.

1.8 SPECIFICATIONS

Table 1-1 is a summary of the M200 and M120 specifications

TABLE 1-1. SPECIFICATIONS

Item	Specifications	
	M200	M120
Input Power Requirement		
Domestic:	95 to 127 VAC, 160 ±1% single phase	Same
Universal:	90 to 140 VAC or 187 to 257 VAC 50 or 60 Hz, ±1% single phase	Same
Power Consumption		
Idle:	150 watts maximum	Same
Printing:	275 watts maximum	Same
Temperature		
Operating:	10°C to 38°C (50°F to 100°F)	Same
Storage	-10°C to 50°C (14°F to 122°F)	Same
Transit:	-40°C to 71°C (-40°F to 160°F)	Same

TABLE 1-1. SPECIFICATIONS (Contd)

Item	Specifications	
	M200	M120
Humidity		
Operating:	20% to 80%, non-condensing	Same
Storage:	10% to 90%, 10% per hour rate of change	Same
Transit	98% maximum, 10% per hour rate of change	Same
Printer Dimensions		
Height		
Cover closed:	21.3 cm (8.38 inches)	Same
Cover open:	57.1 cm (22.48 inches)	Same
Width:	67.1 cm (26.4 inches)	Same
Depth:	59.4 cm (23.38 inches)	Same
Power cord length:	4 meters (13.12 feet)	Same
Print Head Life	300 million characters	200 million characters
Ribbon Life	5 million characters	Same
Printer Weight		
Net:	30 Kg (67 lbs)	Same
Shipping:	37.2 Kg (82 lbs)	Same
Print Characteristics		
Character Rate:	340 characters per second nominal	180 characters per second nominal
Print Method:	Dot matrix, 7 horizontal by 7 vertical	Same
Printable Columns:	132 columns maximum @ 10 cpi	Same

TABLE 1-1. SPECIFICATIONS (Contd)

Item	Specifications	
	M200	M120
Pitch (Horizontal Spacing)		
Standard:	10 characters per 25.4 mm (1 inch); 132 characters/line maximum	Same
Condensed:	16.7 characters per 25.4 mm (1 inch); 219 characters/line maximum	Same
Expanded:	5 characters per 25.4 mm (1 inch); 66 characters/line maximum	Same
Interfaces		
Standard:	Short-Line Parallel (maximum interface cable length of 15 meters)	Same
Options:	a. Long-Line Parallel (maximum interface cable length of 150 meters)	Same
	b. Serial (maximum interface cable length of 15 meters with RS232; 457 meters with current loop)	
	c. DPC Centronics-Compatible (maximum interface cable length of 15 meters)	Same
Line Spacing		
Standard:	6 lines per 25.4 mm (1 inch)	Same
Optional:	8 lines per 25.4 mm (1 inch)	Same
Paper Feed		
Slew: (Minimum slew rate)	254 mm (10 inches)/second	Same
Step: (Single line advance)	50 milliseconds maximum	Same
Throughput		
Full Line: (132 characters)	125 lines per minute	75 lines per minute
Short Line:	300 lines per minute	200 lines per minute

TABLE 1-1. SPECIFICATIONS (Contd)

Item	Specifications	
	M200	M120
Paper Form Requirements	Standard fan-folded, edge-punched	Same
Width:	7.62 cm to 40.64 cm (3 inches to 16 inches) overall	Same
Length:	The basic printer accommodates a 27.94 cm (11 inches) fixed forms length	Same
	A 30.48 cm (12 inches) is available as an option	Same
	Printers equipped with an optional forms length selector switch can accommodate 11 different forms lengths ranging from 7.62 cm (3 inches) to 35.56 cm (14 inches)	Same
	Printers equipped with the optional TCVFU can accommodate forms lengths of up to 61 cm (24 inches) at 6 LPI, and up to 45.72 cm (18 inches) at 8 LPI	Same
	Printers equipped with the DAVFU option can accommodate forms lengths of up to 107 cm (42 inches) at 6 LPI, and up to 76.2 cm (30 inches) at 8 LPI	Same
Weight:	38 g/m^2 (10 lb) minimum	Same
Thickness:	0.71 mm (0.028 inch) maximum	Same
Environmental Conditions: (Recommended operating and storage of forms for best printing)	16°C (60°F), at a relative humidity of 40% to 60%	Same
Ribbon Selection Guide (Specifically qualified for matrix printing)	Fabric ribbon impregnated with non-fading ink, 12.7 mm (1/2 inch) by 36 meters (120 feet), continuous loop cassette	Same

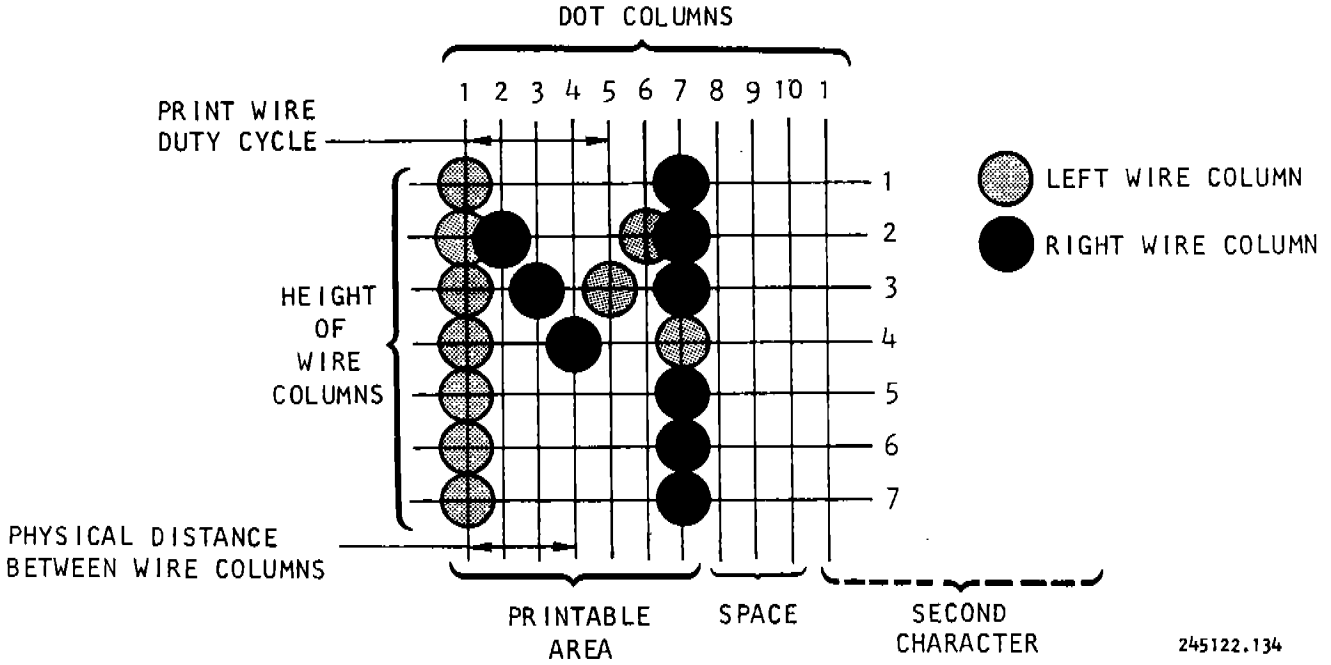


Figure 1-5. M200 Character Matrix and Formation

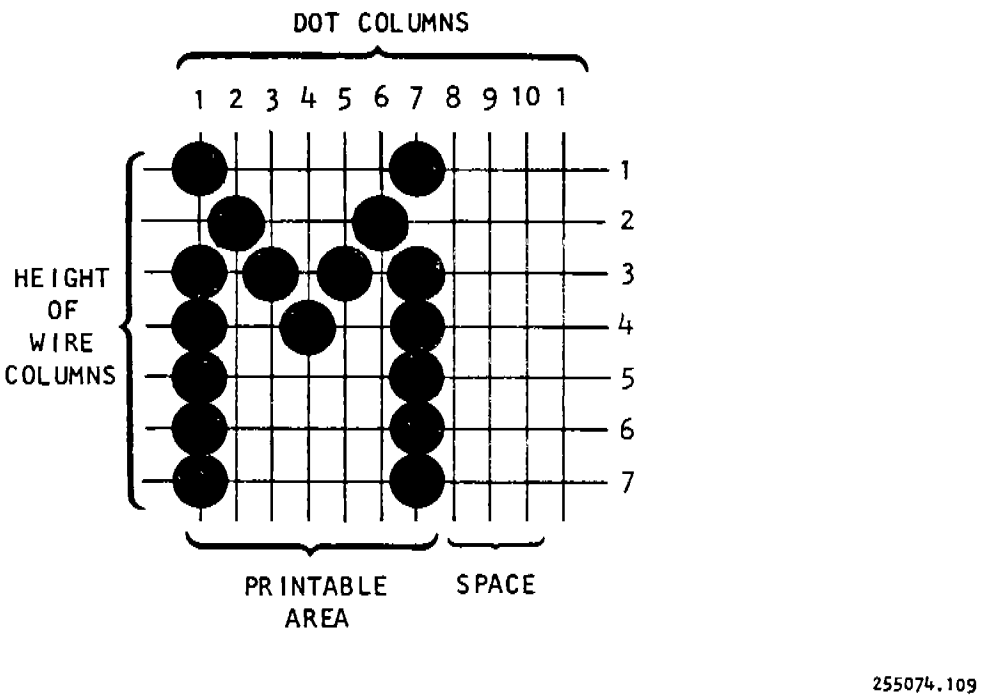


Figure 1-6. M120 Character Matrix and Formation

1.9 PRINTABLE FORMS

The printer is capable of printing on forms with as many as six parts. The duplicate parts may be printed on either carbonless paper or single shot carbon paper. Other multi-part forms may be used but should be tested under user operating conditions to verify proper paper handling and printout legibility. The recommended storage environment of the paper forms is 60° F (42° C) to 80°F (60°C) at about 40% to 60% relative humidity.

Table 1-3 lists the recommended form thickness and paper weights for both carbonless paper and single shot carbon paper. Lower paper weight forms may be used in all cases as long as the paper weight is above 10 pounds (37 grams per square meter) for any individual part.

The first column of table 1-2 is labeled "No. of Parts", and the numbers 1 through 6 represent the number of parts to a form. The "Form Part Location" heading is divided into six columns, each column corresponding to the page number of a multiple part form. Form Part Location column 1 represents the first part, or original copy, and is the copy closest to the print head after the form has been inserted into the printer and is ready for print.

The figures in each of the six Form Part Location columns are suggested paper weights for each form part, expressed in pounds and grams per square meter (gsm). Suggested total form thickness is given in inches and millimeters.

Example: For a carbonless three-part paper form, table 1-3 suggests the following weights:

Part 1 (in Form Part Location column 1) - 20 (75)
Part 2 (in Form Part Location column 2) - 15 (56)
Part 3 (in Form Part Location column 3) - 100 (163)*

* The 100 (163) gsm is the weight for tab card stock, based upon paper dimensions of 24" x 36" per 500 sheets. All other weight values are based on paper dimensions of 17" x 22" per 500 sheets. A total thickness of all three example parts should be 0.014 inch (0.36 millimeter), as shown in the "Form Thickness" column of table 1-2.

NOTE

The heaviest weight form part should be the last page of a multiple part form located farthest from the print head when the form is inserted into the printer.

TABLE 1-2. M-SERIES PRINTABLE FORMS

Carbonless Paper								
No. of Parts	Form Part Location						Form Thickness	
	1	2	3	4	5	6	Inches	Millimeters
1	100(163)						.0070	.18
2	20(75)	100(163)					.0110	.28
3	20(75)	15(56)	100(163)				.0140	.36
4	15(56)	15(56)	15(56)	100(163)			.0175	.44
5	15(56)	15(56)	15(56)	15(56)	20(75)		.0170	.43
6	15(56)	12(45)	12(45)	12(45)	12(45)	20(75)	.0185	.47

Carbon Paper Using 8 lb (19 gsm) Single Shot Carbon								
No. of Parts	Form Part Location						Form Thickness	
	1	2	3	4	5	6	Inches	Millimeters
1	100(163)						.0070	.18
2	20(75)	100(163)					.0130	.33
3	20(75)	15(56)	100(163)				.0180	.46
4	15(56)	15(56)	15(56)	100(163)			.0240	.61
5	15(56)	15(56)	15(56)	15(56)	20(75)		.0220	.56
6	15(56)	12(45)	12(45)	12(45)	12(45)	20(75)	.0240	.61

SECTION II

PREPARATION FOR USE

2.1 INTRODUCTION

This section contains information that assists personnel in preparing the printer for use. Included are printer space requirements, unpacking procedures, mounting procedures, power connections, and option configuration header information. Paper loading, ribbon replacement, and print head replacement procedures are augmented with pictorial guides. Other information supplied in this section includes interface connection, TCVFU tape preparation, and DAVFU preparation.

2.2 SPACE REQUIREMENTS

Figure 2-1 is an outline drawing of the printer dimensions. Prior to unpacking, select a flat surface with suitable dimensions on which the printer can be placed for operation. Allow sufficient clearance for the printed paper to exit freely from the printer and into a designated printed forms receiver. In addition, allow a minimum of 7.6 cm for ventilation clearance on the right side of the printer per figure 2-1. Outline dimensions for the printer equipped with the optional paper receptacle are illustrated in figure 2-2.

2.3 UNPACKING THE PRINTER

The printer is shipped in a reusable cardboard container, and held in place by molded polystyrene end caps. Included in the container, but packaged separately, is the shipaway kit containing the printer User's Guide, a ribbon cassette, and a print sample.

The procedure for unpacking the printer is as follows:

a. Open the shipping container and remove the printer. Save the packing material for possible future use.

WARNING

Two or more persons may be needed to lift the printer onto the mounting surface because of its weight of 75 pounds (34 kg).

b. Remove all wrapping material from the printer and place it on the mounting surface.

c. Remove the shipaway kit from the shipping container.

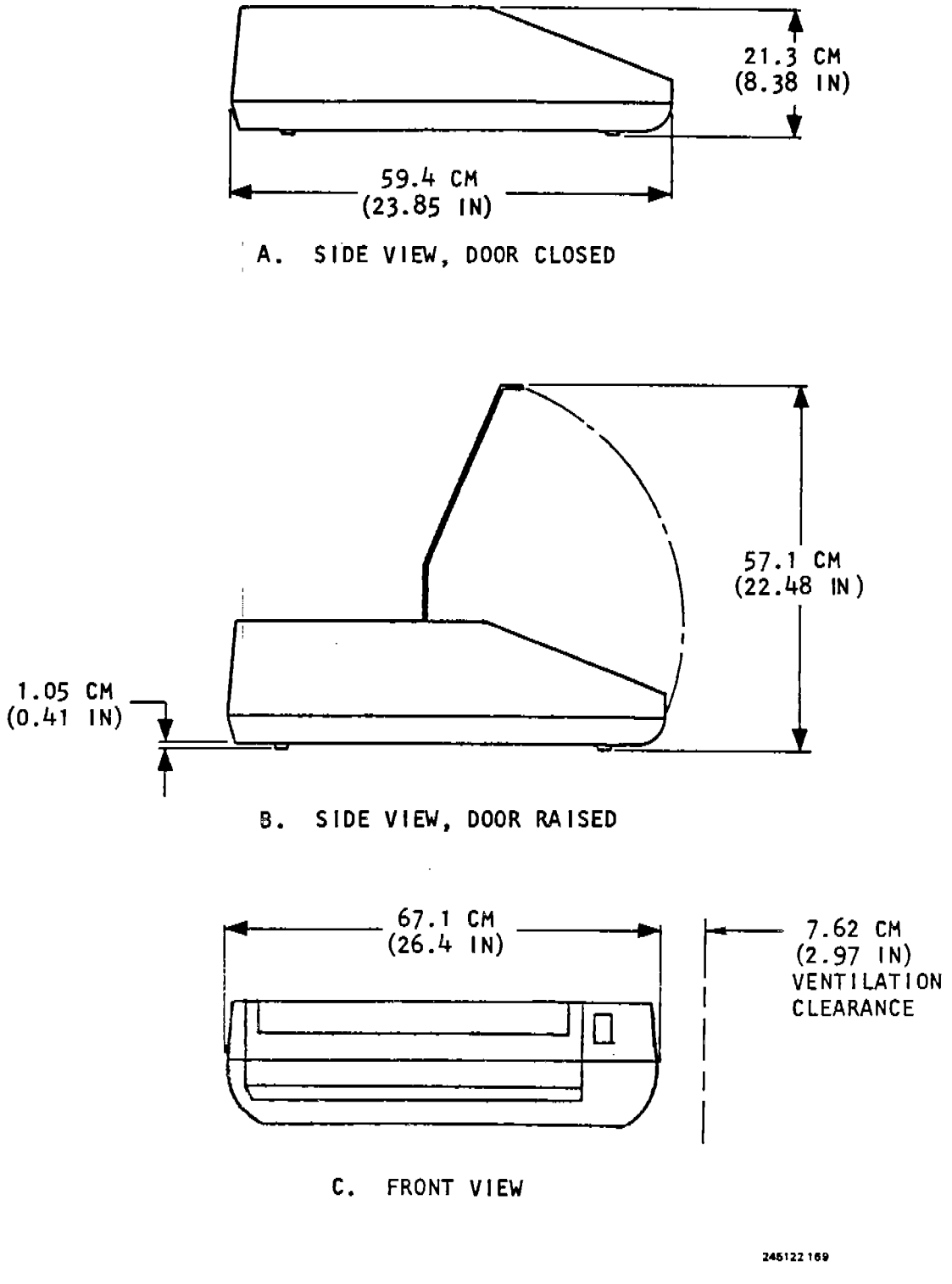


Figure 2-1. Standard M-Series Printer Outline Dimensions

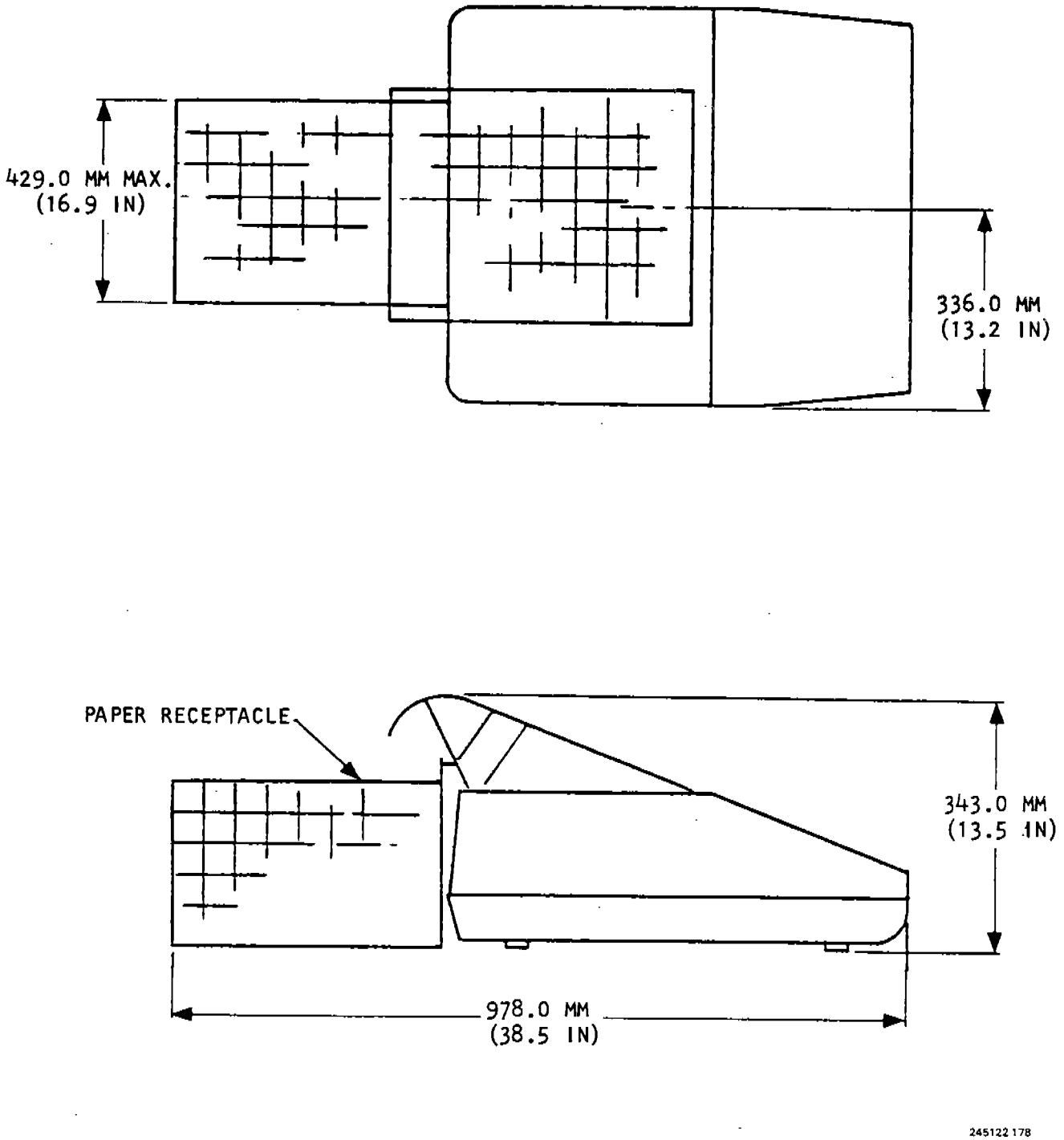


Figure 2-2. Printer with Optional Paper Receptacle, Outline Dimensions

d. Check the contents of the container against the packing slip attached to the outside of the container.

e. Raise the door and remove the two plastic cable ties and the plastic foam block from the shuttle/print head assembly. Save the foam block for possible reshipment.

f. Verify that the shuttle/print head assembly moves freely back and forth on the shuttle rail.

2.4 MOUNTING PROCEDURES

The printer may be mounted on any flat surface which is capable of supporting its weight. An optional pedestal is available for installations requiring a floor mount arrangement.

2.4.1 Optional Pedestal Mounting (Figures 2-3 and 2-4)

Perform the following procedure to mount the printer onto the optional pedestal.

a. Assemble the pedestal per figure 2-3, using the parts supplied in the pedestal kit. To do this, secure each side of the center panel to one of the pedestal legs with two hex-head screws and washers. Next, place two threaded feet within the bottom of each pedestal leg, and then install the paper basket.

b. Referring to figure 2-4, position the printer on top of the pedestal and secure with six screws and washers.

c. Adjust the four feet on the pedestal legs until the printer is level.

d. At the rear of the printer, insert the male end of one of the ground cables into the female jack between the fuse and power cord.

e. Mount the male end of the other ground cable into the jack of the paper basket.

f. Install the terminal spade ends of both ground cables between the two external tooth washers, and secure to the pedestal leg with the screw.

2.5 INITIAL POWER CONNECTION

Perform the following procedures to connect power to the printer:

a. Verify that the power cord, plug, and fuse supplied with the printer match the specified power indicated on the nameplate located on the back of the printer.

b. Verify that the available power is the same as the required power specified on the printer's nameplate.

c. Connect the printer power cord into the available power outlet.

d. Set the power switch, located at the lower left front of the printer, to the on position.

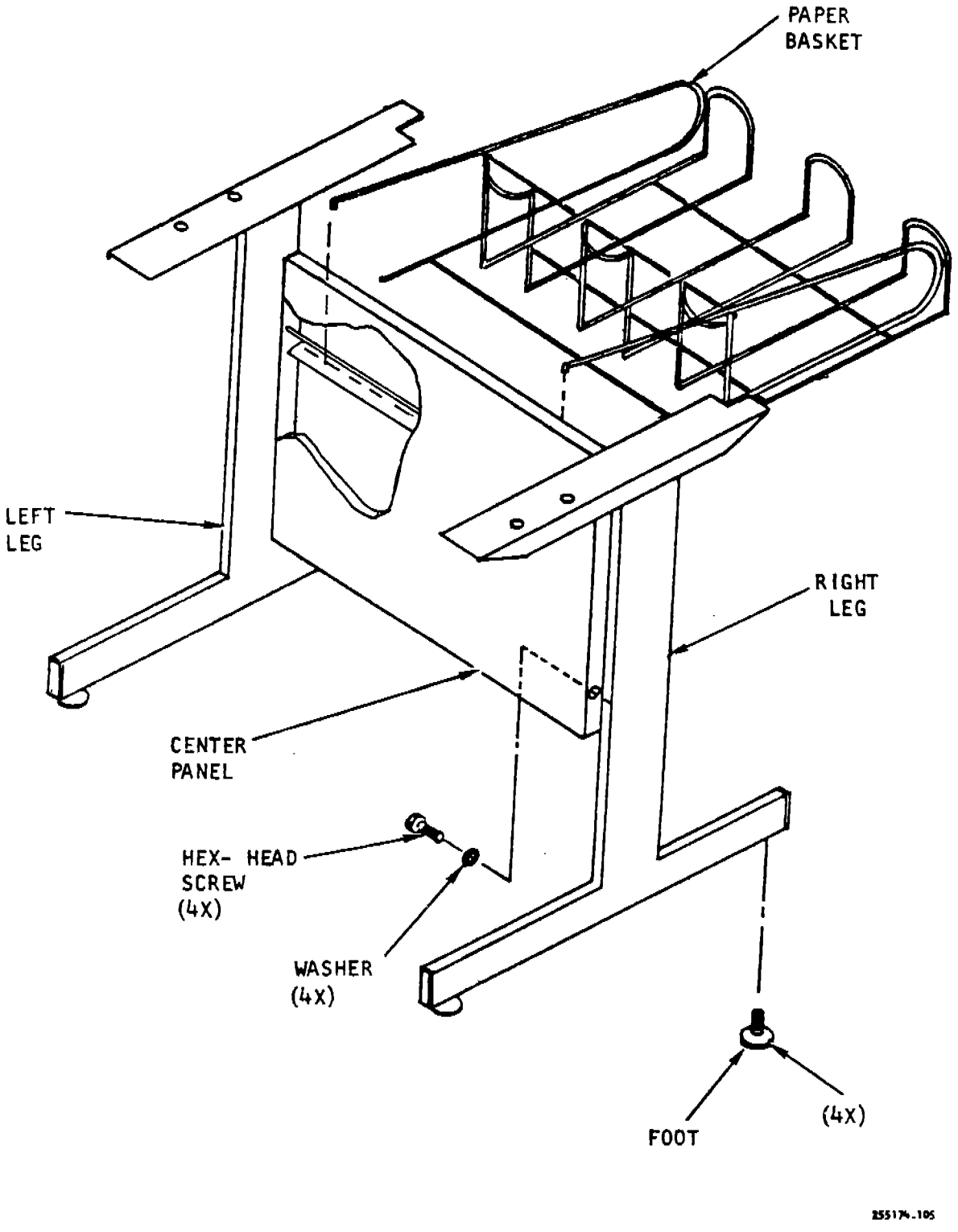


Figure 2-3. Pedestal Assembly

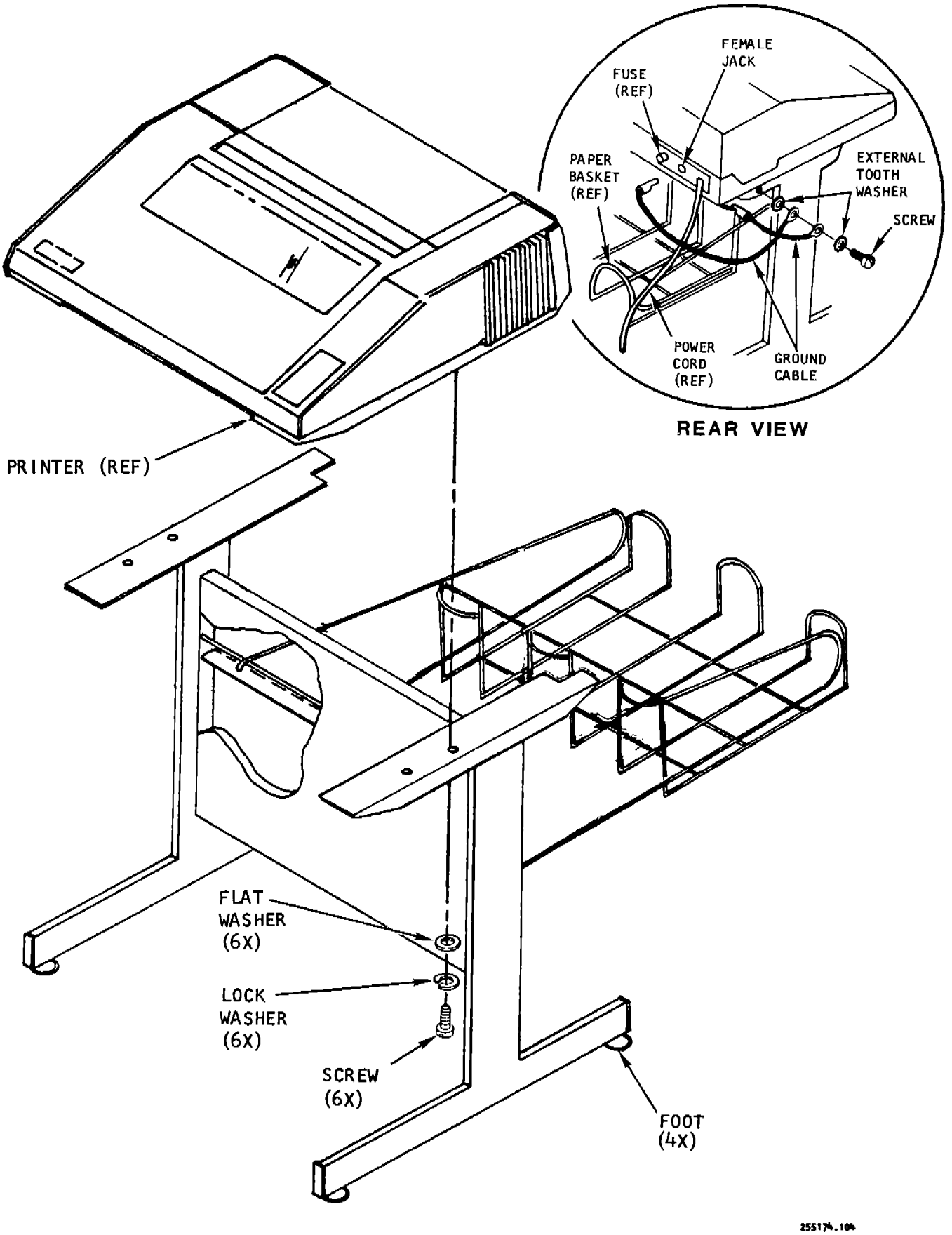


Figure 2-4. Pedestal-Installation

2.6 POWER CONVERSION FOR OPTIONAL UNIVERSAL POWER SUPPLY

Printers equipped with the optional universal power supply have the capability of operating on one of the following power options, as specified by the user:

a. 90 to 140 VAC, 50 Hz ± 1 Hz

b. 90 to 140 VAC, 60 Hz ± 1 Hz

c. 187 to 257 VAC, 50 Hz ± 1 Hz

d. 187 to 257 VAC, 60 Hz ± 1 Hz

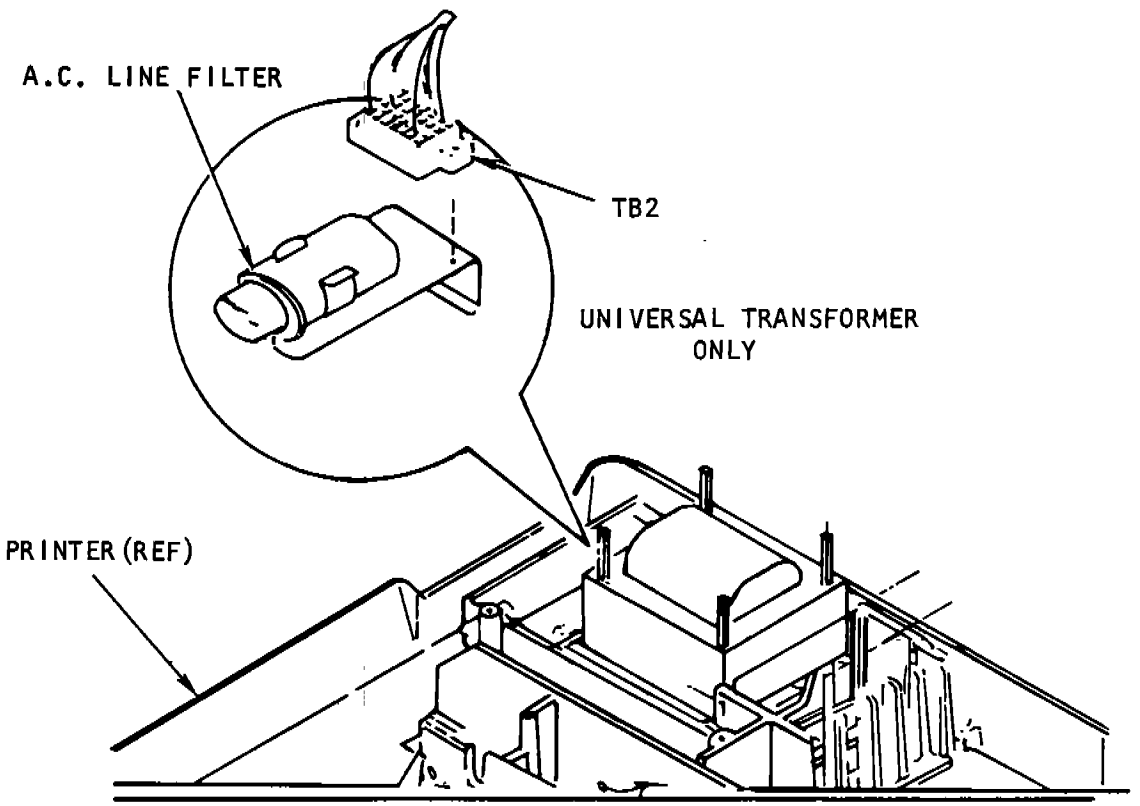
If the universal power supply should require reconfiguration, refer to table 2-1 and figure 2-5, and perform the applicable procedure given in the following paragraphs.

WARNING

Disconnect the power cord from the power outlet. Do not make any power configuration changes with the power cord connected to the power outlet, as injury to personnel may occur.

NOTE

To reconfigure the universal power supply from one power option to another, wires on TB2, C4, and the base terminals must be relocated. Note that the listed color-coded wires shown in table 2-1 may be connected at any one of the several possible locations.



255174.108

Figure 2-5. TB2 Terminal Block Location Diagram

TABLE 2-1. OPTIONAL UNIVERSAL POWER SUPPLY TB2, C4, AND BASE TERMINAL WIRE CONFIGURATION

Wire Color	TB2 Pin Position Number			
	115 VAC 60 Hz	115 VAC 50 Hz	250 VAC 60 Hz	250 VAC 50 Hz
Red	8	8	16	16
Orange/Yellow	6	10	6	10
Orange/White	9	6	9	6
Brown	3	3	7	7
Brown/Yellow	7	14	12	14
Brown/White	13	7	13	12
Orange/White	27	26	27	26
White	23	24	23	24
Violet/White	22	21	22	21
*Red/White	Base Term	C4	Base Term	C4
*Red/Black	C4	Base Term	C4	Base Term

*Wires not located on TB2

NOTE

For 250V, 50 Hz or 60 Hz operation, replace fuse F1 with a 1.5A, slo-blo. For 115V, 50 Hz or 60 Hz operation, replace fuse F1 with a 3A slo-blo.

NOTE

Ensure that the nameplate reflects the new power configuration.

2.6.1 Power Plugs

The universal power supply is configured at the factory to user specifications. Printers configured at the factory for 90 - 140 VAC operation are equipped with a power cord terminated in a molded power plug that fits into a standard three-terminal 115 VAC domestic power outlet. Printers configured at the factory for 187 - 257 VAC operation are terminated in a standard three-prong 250 VAC domestic power plug.

When changing from 90 - 140 VAC operation to 187 - 257 VAC operation, replace the existing power plug with a 250 VAC domestic power plug, Part Number DPC 800827-002. Wiring information is shown in figure 2-6. When changing from 187 - 257 VAC operation to 90 - 140 VAC operation, replace the existing power plug with a 125 VAC domestic power plug, DPC Part Number 800827-004. When changing to foreign power, replace the existing power plug with one that fits into the applicable foreign power outlet.

2.6.2 Labels

Printers equipped with a universal power supply use two labels to show the transformer power configuration and required fuse size. These labels are located at the rear of the printer as shown in figure 2-7. When changing voltage, or voltage and frequency, both the voltage/frequency label and the fuse label must be replaced.

2.6.3 Optional 115 VAC/60 Hz

WARNING

Do not attempt to perform any power conversion procedure with the power cord connected.

Disconnect from TB2 the color-coded wires listed in table 2-1, and reconnect them as shown in the 115 VAC/60 Hz column of table 2-1. Replace fuse F1 with 3A slo-blo fuse, and the two labels as appropriate.

2.6.4 Optional 115 VAC/50 Hz

WARNING

Do not attempt to perform any power conversion procedure with the power cord connected.

Disconnect from TB2 the color-coded wires listed in table 2-1, and reconnect them as shown in the 115 VAC/50 Hz column of table 2-1. Replace fuse F1 with a 3A slo-blo fuse, and the two labels as appropriate.

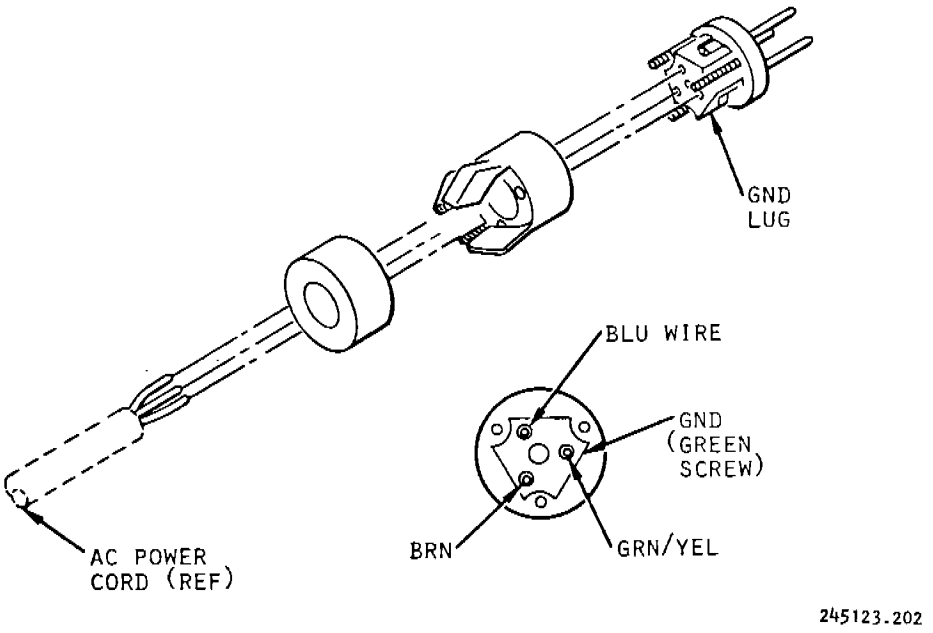


Figure 2-6. 250V Power Plug Wiring Details

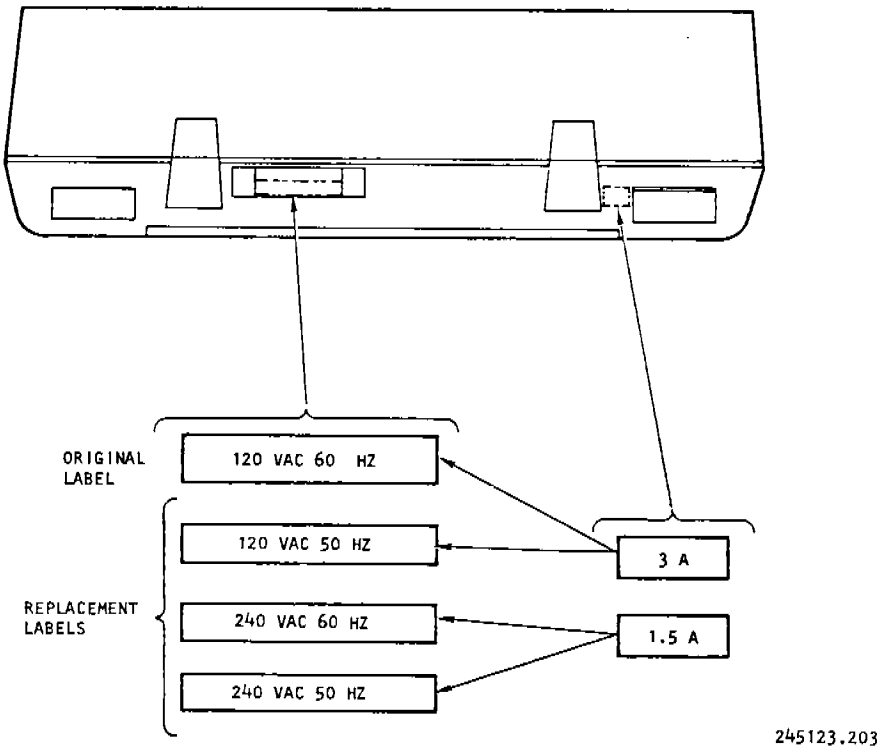


Figure 2-7. Power and Fuse Labels

2.6.5 Optional 250 VAC/60 Hz

WARNING

Do not attempt to perform any power conversion procedure with the power cord connected.

Disconnect from TB2 the color-coded wires listed in table 2-1, and reconnect them as shown in the 250 VAC/60 Hz column of table 2-1. Replace fuse F1 with 1-5A slo-blo fuse, and the two labels as appropriate.

2.6.6 Optional 250 VAC/50 Hz

WARNING

Do not attempt to perform any power conversion procedure with the power cord connected.

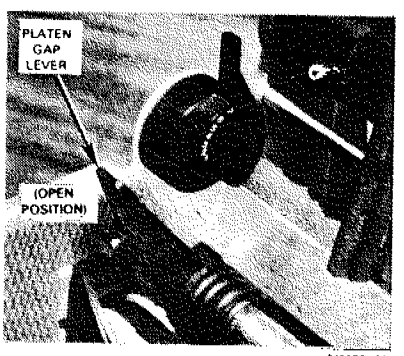
Disconnect from TB2 the color-coded wires listed in table 2-1, and reconnect them as shown in the 250 VAC/50 Hz column of table 2-1. Replace fuse F1 with a 1.5A slo-blo fuse, and the two labels as appropriate.

2.7 PAPER LOADING

Load paper according to the following procedure:

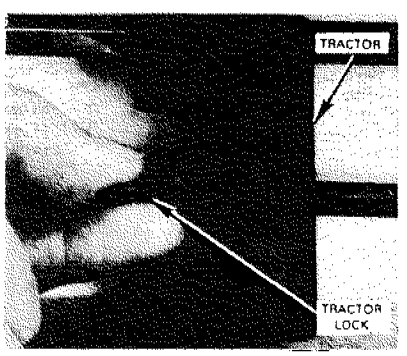
a. Place the printer POWER switch to ON.

b. Raise the top cover. Rotate the platen gap lever to its open position (away from the platen).



c. Press the TOP OF FORM switch to set the printer mechanism to the top of form position.

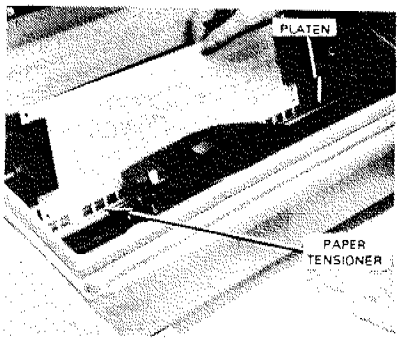
d. Rotate both tractor locks downward (only one shown). Move the tractors to their respective outermost positions.



NOTE

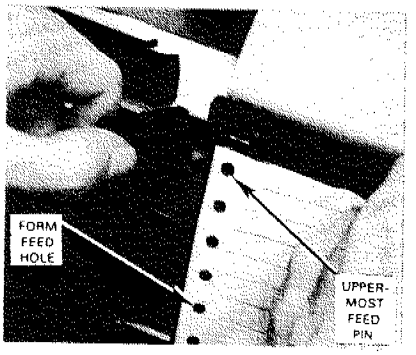
This step is only required if changing to a different width paper or a different margin from that previously used.

e. Insert paper into the desired paper loading port (the front is shown, although the bottom or optional rear port may also be used). Slide the paper up between the platen and the paper tensioner.



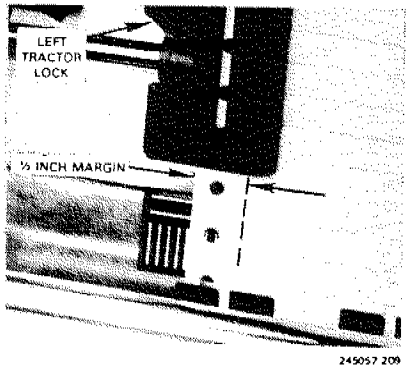
245057 207

f. Open the pressure plate of the left tractor. Engage the top left form feed hole to the uppermost tractor feed pin and close the pressure plate.



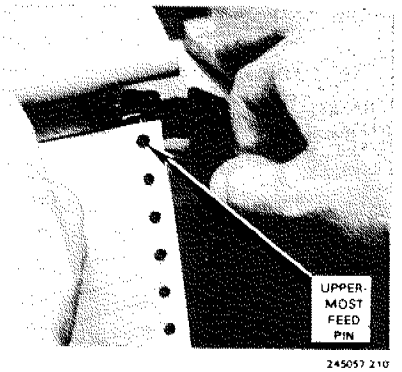
245057 208

g. Laterally position the left tractor to align the paper to the desired mark on the forms alignment scale. (Aligning the paper to the center vertical line will give a 1/2 inch margin for the first column of print). In the adjacent figure, paper is installed with the first print column indented approximately 1/2 inch. After the paper has been aligned, rotate the left tractor lock upward.



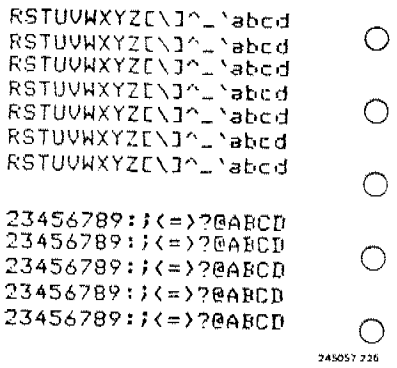
245057 209

h. Open the pressure plate of the right tractor. Engage the top right form feed hole to the uppermost tractor feed pin, ensuring that the paper is not skewed.

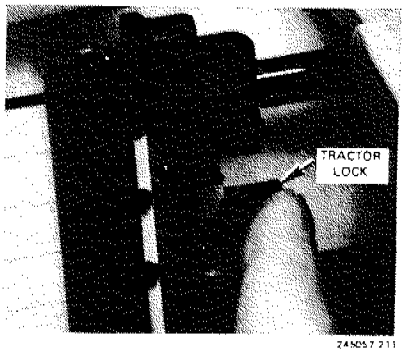


245057 210

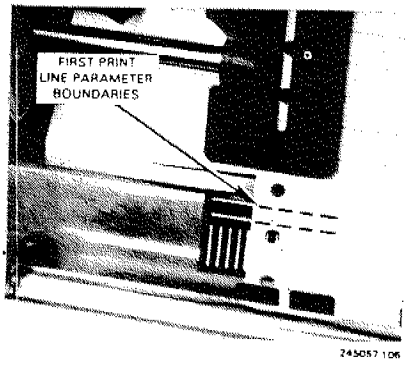
i. Position the right tractor for proper tension by ensuring that the form feed holes are not deformed where the tractor feed pins engage.



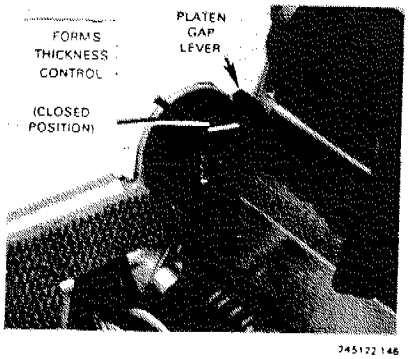
j. Close the pressure plate and rotate the tractor upward.



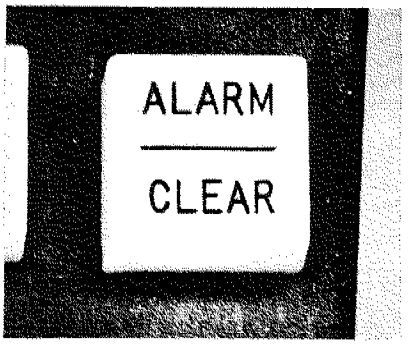
k. Rotate the vertical paper adjust knob to vertically position the paper to the desired first print line position. This line will be printed within the two horizontal lines of the forms alignment scale.



l. Rotate the platen gap lever to its closed position (toward the platen) and set the forms thickness control to the number that matches the thickness of the form being used. This is a preliminary setting. Due to variances between different forms, the setting on the forms thickness control may not correspond exactly with the thickness of the form being used. To obtain the exact setting, run a self-test pattern per paragraph 3.4, then adjust the forms thickness control for optimum print contrast. Close the top cover.



m Press the ALARM/CLEAR switch to initialize the printer logic.

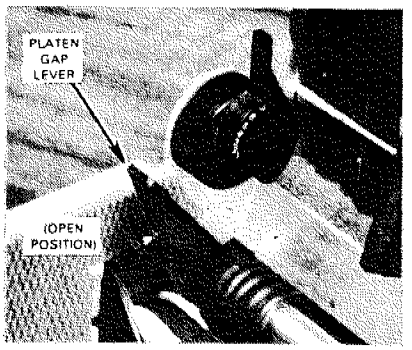


245057 103

2.8 RIBBON REMOVAL/REPLACEMENT

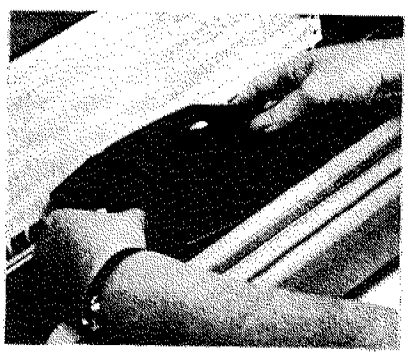
The ribbon used on this printer is a cassette ribbon assembly and may be replaced with the printer powered up or shut down. To replace the ribbon cassette, perform the following procedure:

a. Raise the top cover. Rotate the platen gap lever to its open position (away from the platen).



245122 170

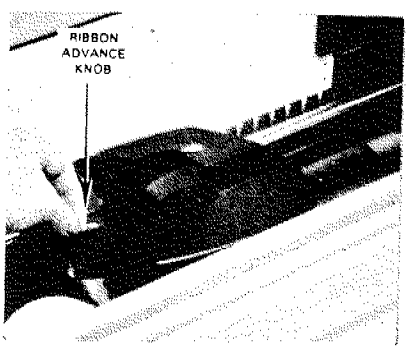
b. Lift the ribbon cassette off the print head. Install the new ribbon cassette over the print head. Press down evenly until the cassette snaps into place.


245057 216

NOTE

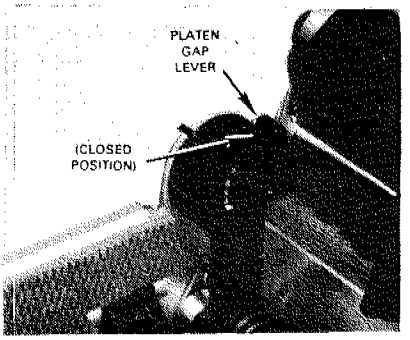
It may be necessary to rotate the ribbon advance knob clockwise while seating the ribbon cassette on the head carriage to ensure that the ribbon drive mechanism meshes properly (see step c).

c. Rotate the ribbon advance knob clockwise to ensure that the ribbon is taut and properly positioned in front of the print head.



245057 218

d. Rotate the platen gap lever to its closed position (toward the platen). Close the top cover and press the ALARM/ CLEAR switch. If the printer has been powered up and properly loaded with paper, the printer may now be placed on line.



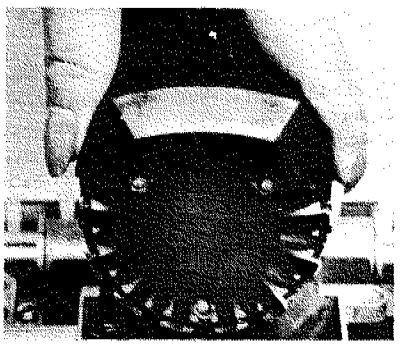
245122 146

2.9 PRINT HEAD REPLACEMENT

To remove and replace the print head, perform the following procedure:

CAUTION

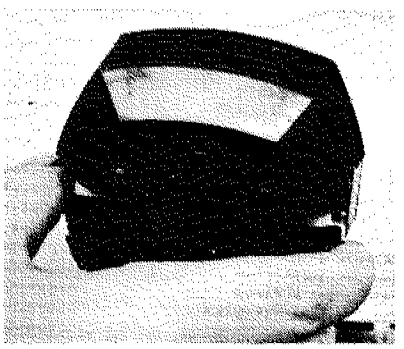
The printer must be shut down prior to head replacement. Allow sufficient time for the print head to cool before proceeding.


245122 174
RIGHT

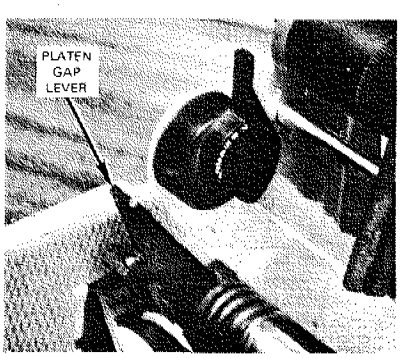
Removal

CAUTION

During removal or replacement, the print head must be grasped at the top (not the front) as shown.

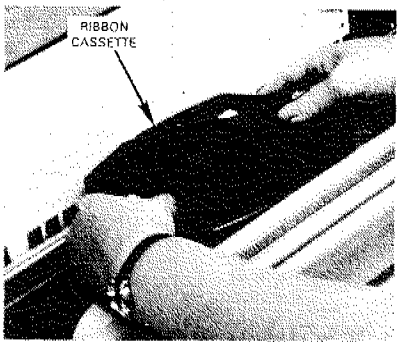

245122 173
WRONG

a. Open the printer top cover. Rotate the platen gap lever to its open position (away from the platen).



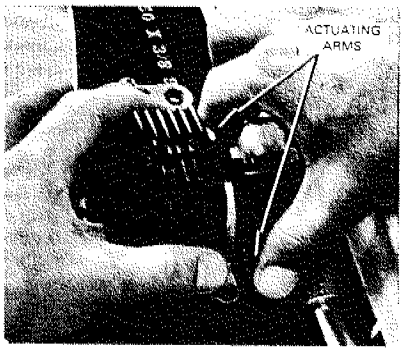
245122 170

b. Remove the ribbon cassette from the print head per paragraph 2.9.



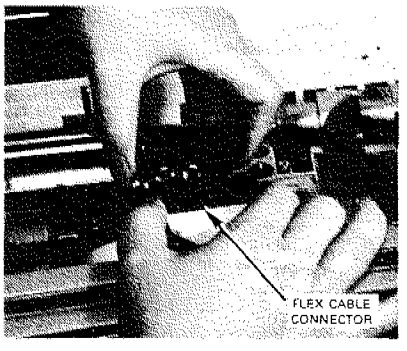
245057A 217

c. To remove the print head: squeeze the print head locking mechanism actuating arms, then pull the print head approximately 3/16 inch toward the front of the printer and lift clear of the shuttle assembly.



245074 198

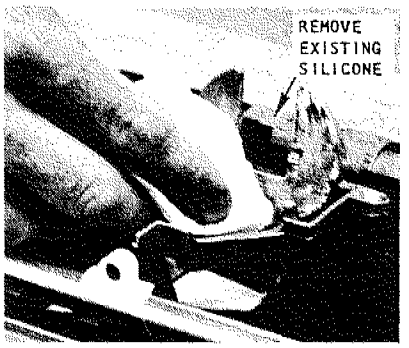
d. Disconnect the print head flex cable connector from the print head. Connector is a "snap" fit and may require some effort to disconnect.



245057 219

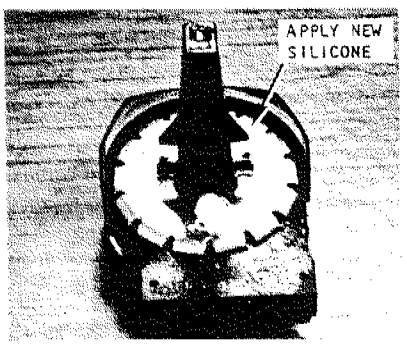
Preparation Prior to Replacement

a. Remove existing silicone compound (white grease) from the shuttle by wiping thoroughly with a tissue of soft cloth.



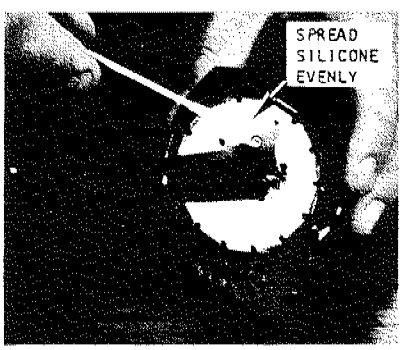
255074.101

b. Apply new silicone compound directly on the magnetic structure surface of the print head (DPC Part Number 800205).



255074.102

c. Using a cotton-tipped applicator, spread the silicone compound evenly throughout the magnetic structure surface.



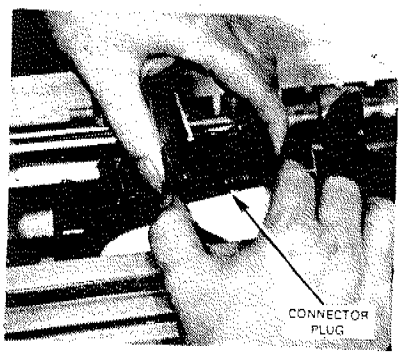
255074.103

Replacement

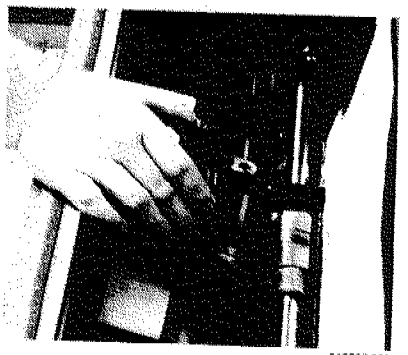
CAUTION

Touching the print head actuator springs may cause the print wire(s) to protrude out of the print head. Check to make sure that the actuator springs are seated properly and no wire(s) protrude out of the print head.

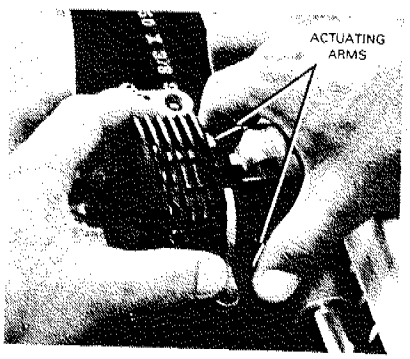
d. To install the new print head, connect the print head flex cable to the new print head, making sure that the connector snaps in place and is well seated.



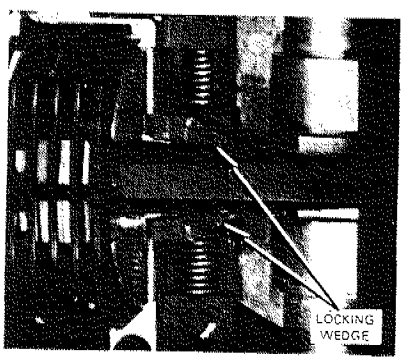
e. Position the new print head over the shuttle mechanism.



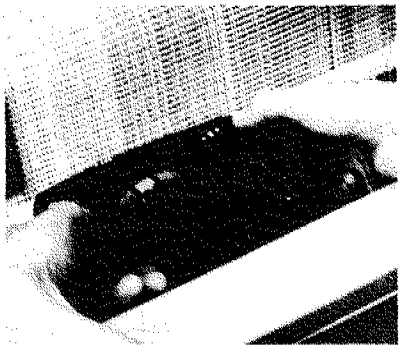
f. Squeeze the print head locking mechanism actuating arms together, slide the print head down the shuttle mechanism, push the print head toward the rear of the printer, and remove pressure from the locking mechanism actuating arms.



g. Ensure that the locking wedge is properly seated.



h. Install the ribbon cassette over the print head. Press down evenly until the cassette snaps into place.

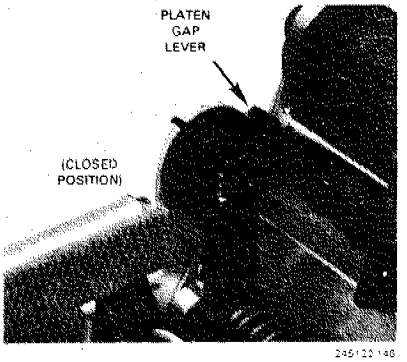


246057 217

NOTE

It may be necessary to rotate the ribbon advance knob clockwise while seating the ribbon cassette on the print head carraige to ensure that the ribbon drive mechanism meshes properly (see step i).

i. Rotate the platen gap lever to its closed position (toward the platen). Close the printer top cover. The printer may now be powered up.



SECTION III

OPERATOR INSTRUCTIONS

3.1 INTRODUCTION

This section contains information necessary to the operation of the printer, and includes the following topics:

a. Operator Controls and Indicators

b. Operating Procedures

c. Self Test Procedures

3.2 OPERATOR CONTROLS AND INDICATORS

Operator controls and indicators are illustrated in figures 3-1 through 3-3 and described in tables 3-1 through 3-3.

TABLE 3-1. ELECTRICAL CONTROLS AND INDICATORS

Figure & Item No.	Item	Function
3-1		
1	ON LINE switch/indicator	Indicator illuminates when printer is on line. Pressing the switch will alternately place the printer on line and off line. If switch is pressed while data is being loaded, indicator will stay illuminated until completion of the data load cycle.
2	ALARM/CLEAR switch/indicator	ALARM indicator illuminates when a fault condition exists. Pressing the CLEAR switch clears the printer logic.
3	TOP OF FORM switch	Momentary action switch. When pressed, advances paper to the top of the next form. When pressed and held, paper will advance continually. Not effective when printer is on line.
4	PAPER STEP switch	Momentary action switch. When actuated, advances paper a single line. When pressed and held, paper will advance continually. Not effective when printer is on line.

TABLE 3-1. ELECTRICAL CONTROLS AND INDICATORS (Contd)

Figure & Item No.	Item	Function
5	TEST switch	When set to ON, allows operator to exercise printer without an external data source. Effective only when printer is on line.
6	POWER switch	Applies primary AC power to the printer.
7	PITCH switch (optional)	This two-position switch allows the operator to select the standard horizontal spacing of 10 characters per inch or the condensed spacing of 16.7 characters per inch.
8	LPI switch	This two-position switch allows the operator to select 6 or 8 lines per inch vertical line spacing. The standard line spacing is 6 lines per inch. When the switch position is changed, the new pitch takes effect at the beginning of the next line.
9	FORM LENGTH switch (optional)	Allows operator to select 11 different forms lengths. Switch not effective when either TCV FU or DAV FU is loaded in VFU memory.
10	STATUS indicator	Two-digit numerical display. When a malfunction occurs, the number displayed corresponds to the last function performed by the printer.

TABLE 3-2. MECHANICAL CONTROLS

Figure & Item No.	Item	Function
3-2 1	Forms thickness control	Moving this lever controls the platen gap, thus allowing printing of forms from one to six parts.
2	Platen gap lever	Moving this lever away from the platen releases the paper tensioner and increases the distance between the print head and the platen to facilitate paper loading, ribbon replacement, and print head replacement.
3	Vertical Adjust	While applying a downward pressure, this knob may be rotated and the paper manually moved to achieve a vertical paper registration.

TABLE 3-2. MECHANICAL CONTROLS (Contd)

Figure & Index No.	Item	Function
4	Pressure plate	The pressure plates may be opened and closed to allow the loading of paper.
5	Tractor locks	Rotating the tractor locks downward allows the tractor to be moved horizontally to achieve a horizontal paper alignment or to accommodate various paper widths.

TABLE 3-3. MISCELLANEOUS OPERATOR CONTROLS

Figure & Index No.	Item	Function
3-3 1	Forms alignment scale	Allows the operator to visually align paper both vertically and horizontally to get proper print-to-form registration.
2		The two horizontal lines represent the line spacing when the printer is printing at 6 lines per inch. The bottom horizontal line indicates the vertical position of the top of the characters of the print row.
3		The vertical lines are 1/10 inch apart and indicate horizontal margin. Placing the edge of the paper directly over the center heavy line will provide a 1/2 inch margin.
4	Paper low interlock switch	Detects the end of the last form. Prevents printer operation when the paper supply is exhausted.

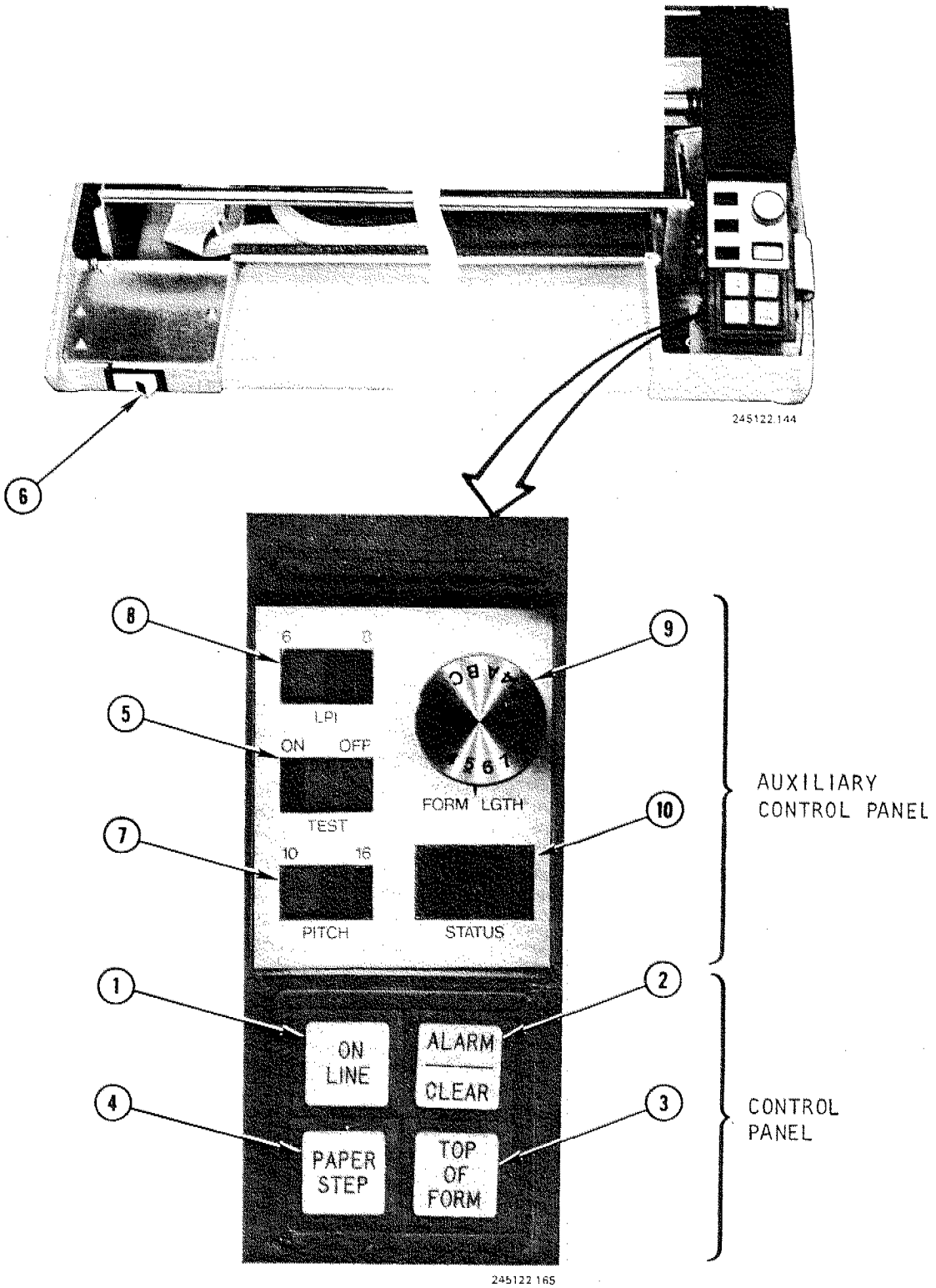


Figure 3-1. Controls, Connectors, and Indicators

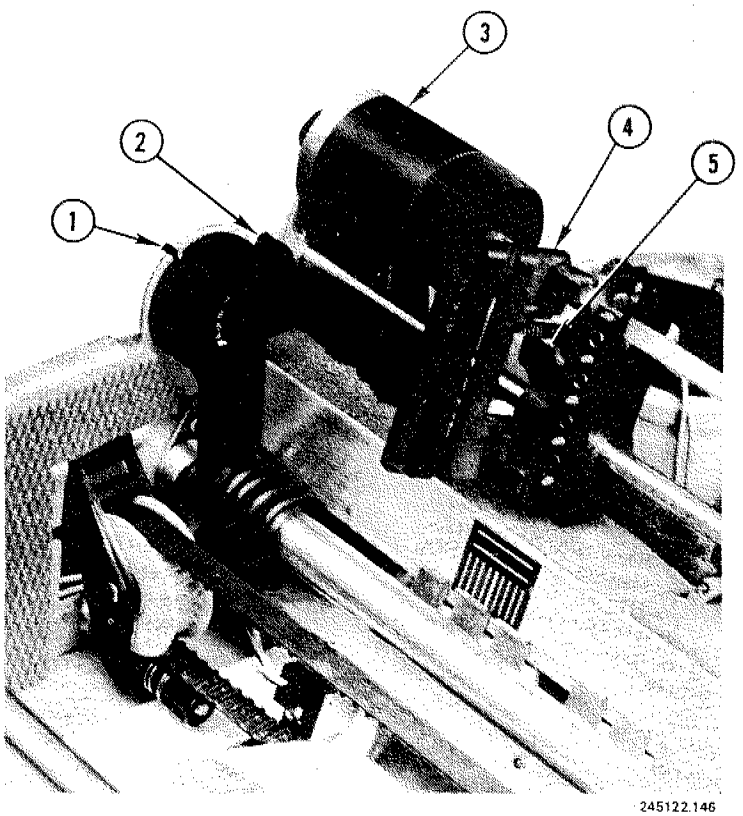


Figure 3-2. Mechanical Controls

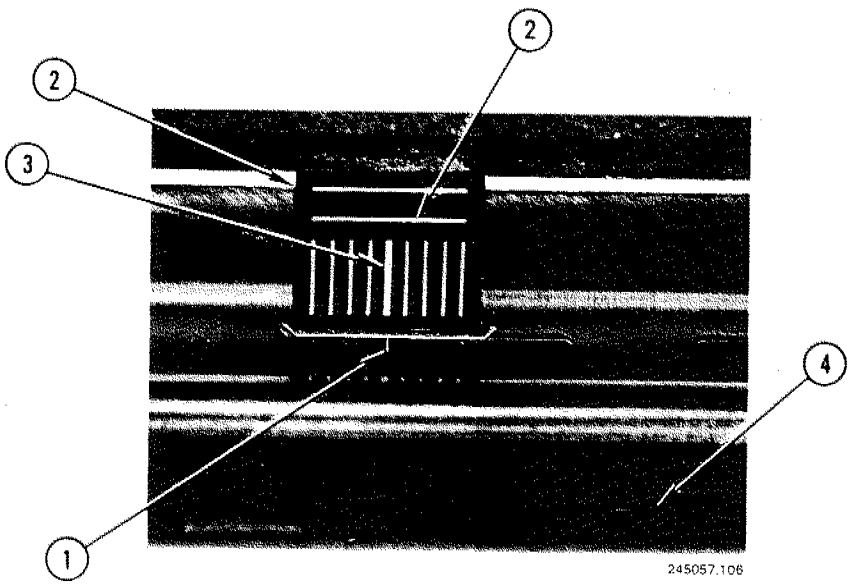


Figure 3-3. Miscellaneous Controls

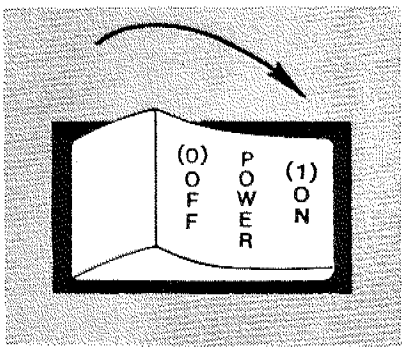
3.3 OPERATING PROCEDURES

Operating procedures include the power-up, shut-down, and self-test procedures.

3.3.1 Power Up

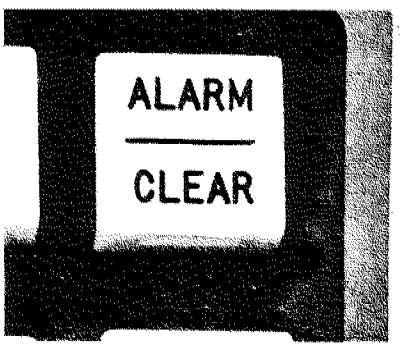
The power up procedure assumes that the printer is properly loaded with paper, the ribbon is properly installed, and all doors and latches are closed. Refer to the applicable procedure in section II.

a. Place the POWER switch to ON. Verify that the status display read-out is 00.



245057.201

b. Ensure that the ALARM indicator is extinguished. If it is illuminated, press the CLEAR switch. If the indicator remains illuminated, a fault condition exists. Consult section VII for fault isolation.



245057.103

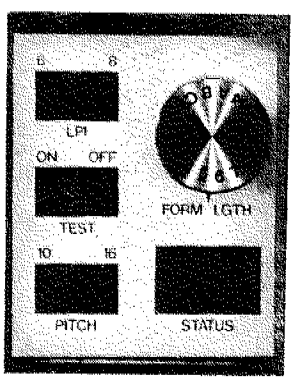
c. Slide open the auxiliary control panel access door and ensure that the TEST switch is set to OFF.

(1) If the optional LPI switch is installed, set it to the desired position.

(2) If the optional PITCH switch is installed, set it to the desired position.

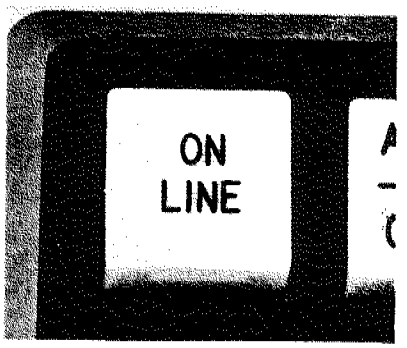
(3) If the optional FORM LGTH selector is installed, ensure that the setting corresponds to the form length being used.

(4) Slide the auxiliary control panel access cover closed.



245122.165

d. Press the ON LINE switch/ indicator and verify that it is illuminated. The printer is now ready for on-line operation.

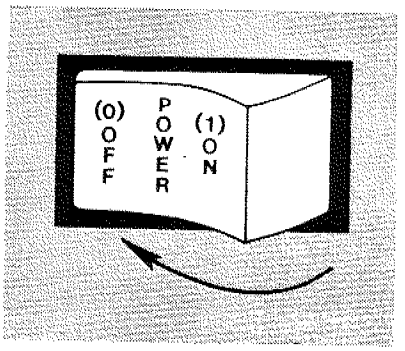


245057.103

3.3.2 Shut Down

a. If the ON LINE switch/indicator is illuminated, press one time. After completion of the print cycle (current print line) the printer will go off line. If the ON LINE indicator fails to go off, it probably is an indication that data is in the buffer without a line terminator.

b. Place the POWER switch to OFF.



245123.301

3.4 SELF TEST

The self test feature allows the printer to be tested under dynamic conditions. It does so by printing a fixed pattern of characters supplied from an internal data source.

A full pattern consists of 264 132-column lines, after which printing stops automatically. In printers equipped with a standard character set, lower case characters are printed as reduced upper-case characters as shown in figure 3-4. In printers equipped with an alternate character set, lower-case characters are printed in the traditional form (figure 3-5). The procedure is as follows:

a. Power up per paragraph 3.3.1.

b. Set the TEST switch to ON.

c. Press the ON LINE switch. Verify that the ON LINE indicator illuminates, and that the printer prints out a test pattern. Printing will stop automatically after 264 lines. If printing stops before completing the full test routine, refer to section VII for fault isolation.

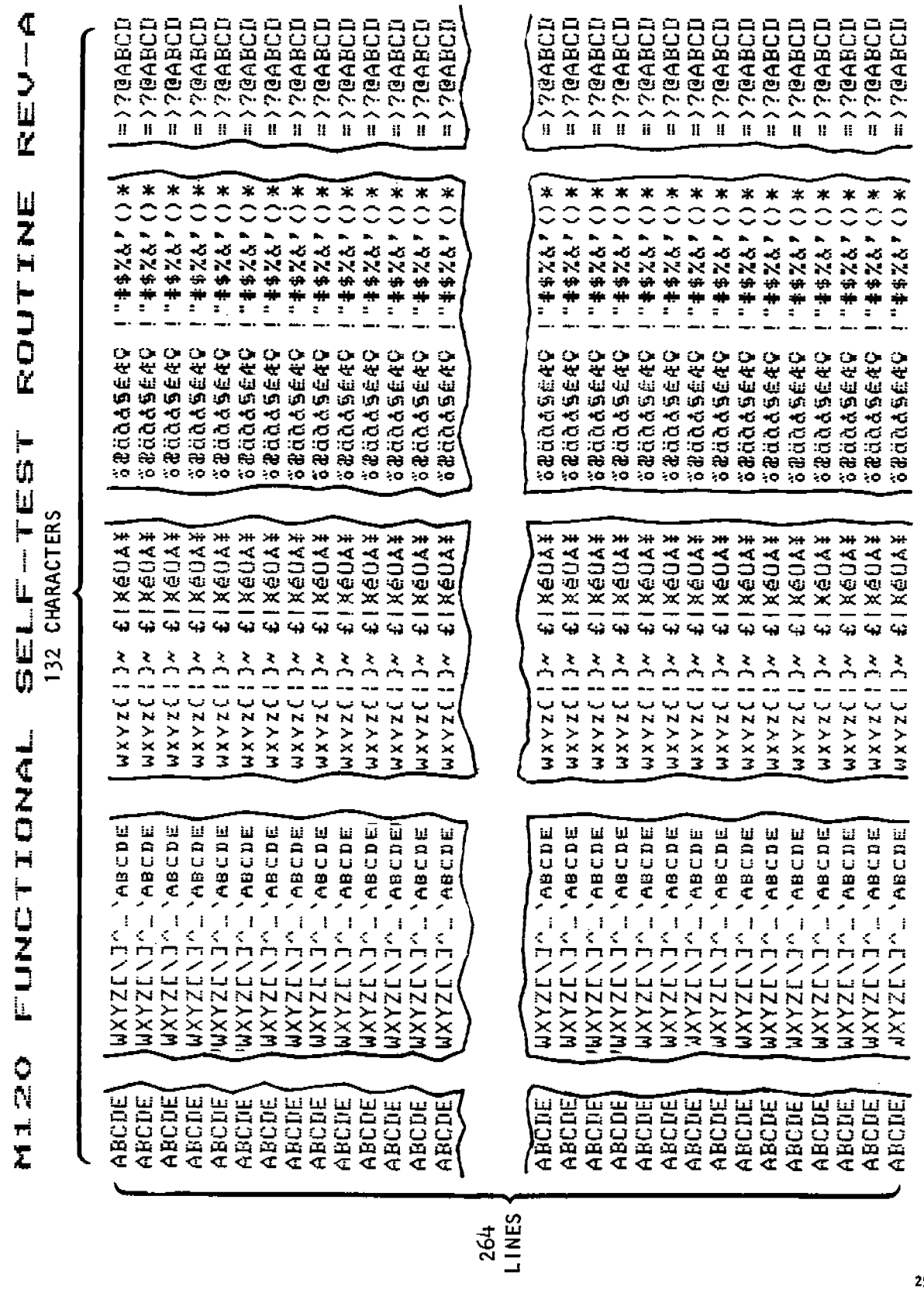


Figure 3-4. Self Test Pattern, M-Series Standard Character Set, with Interface CCA Installed

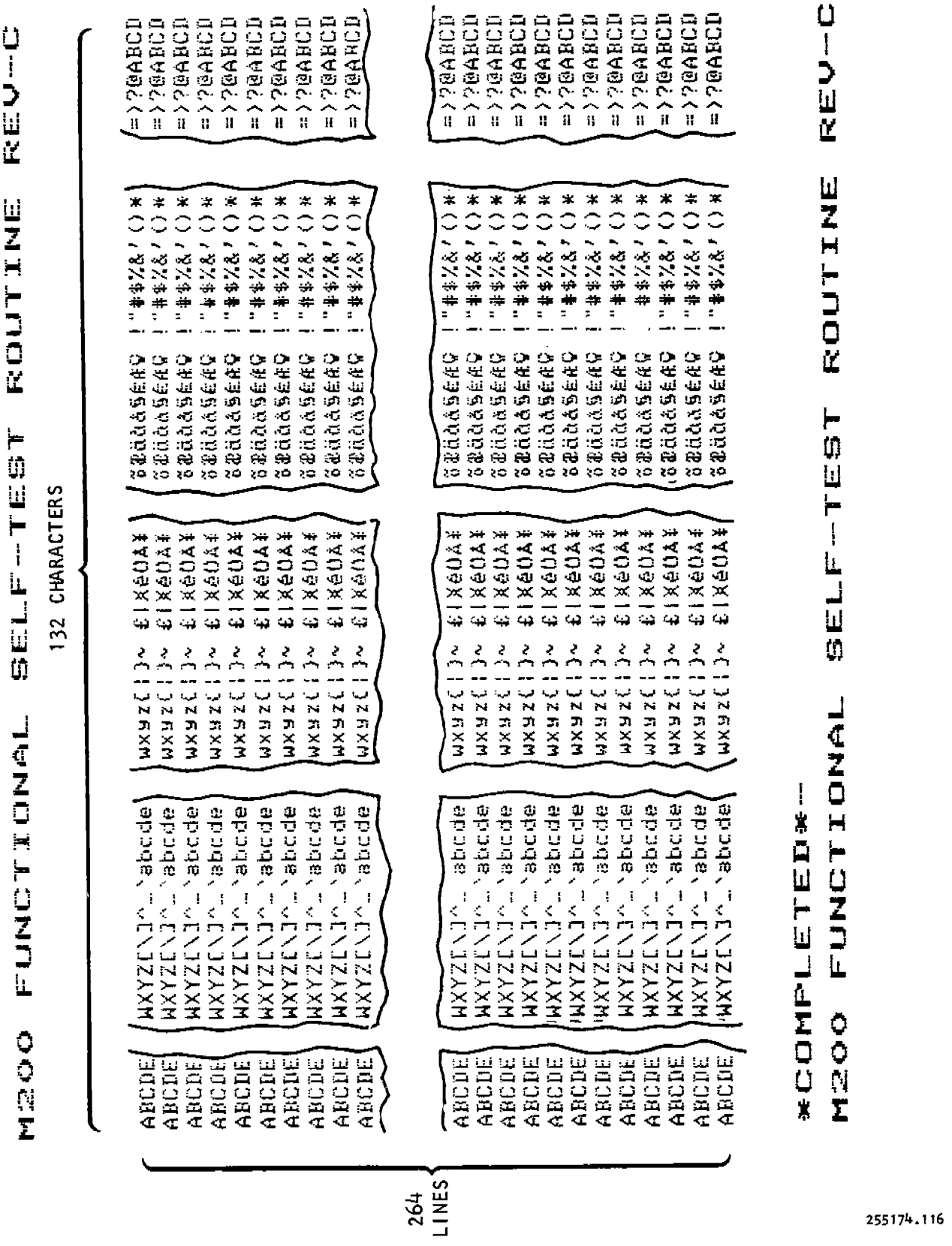


Figure 3-5. Self Test Pattern, M-Series Alternate Character Set, with Interface CCA Installed

To terminate the self test operation in less than 264 lines, press the ON LINE switch, and verify that the ON LINE indicator goes off. Upper-case letters are printed first if the Interface CCA is installed. If the Interface CCA is not installed, lower-case letters are printed first.

NOTE

Once the TEST switch is set to the on position, it is left in that position for the duration of the test. To start or stop a test-print operation, toggle the ON LINE switch.

The printer is now ready to be interfaced to the user system. Proceed to section IV for interface details.

SECTION IV

PRINTER INTERFACING

4.1 INTRODUCTION

The printer interfaces with the user system via an Interface Circuit Card Assembly (Interface CCA) installed within the printer Mother Board. Depending on user requirements, the printer may be configured with one of the four possible Interface CCAs:

a. Short-Line Parallel Interface CCA

b. Long-Line Parallel Interface CCA

c. DPC Centronics-Compatible Interface CCA

d. Serial Interface CCA

The following paragraphs provide a brief description of each Interface CCA type, including signal requirements, operation, timing, parameter switch settings, signal definitions, and pin assignments. Since the Short-Line and Long-Line Interface CCAs operate in an almost identical manner, these two Interface CCAs are discussed under common paragraph headings.

4.2 SHORT AND LONG LINE INTERFACE DESCRIPTION

4.2.1 Interface Circuits

Two different interface circuits have been designed to accommodate both short and long line data transmission. The standard short-line interface circuit operates at a maximum recommended cable length of 15 meters (49 feet). An optional long-line circuit is offered using differential drivers and receivers that are capable of operating up to a distance of 150 meters (492 feet). The two circuits have the following features:

a. Short Line

Signals between the user and printer should be transmitted over twisted pair wires with a maximum recommended cable length of 15 meters.

The user transmitter circuit must be able to sink and source ten (10) standard TTL loads. The user receiver circuit does not require more than ten (10) standard TTL loads.

Logic '1' Must be more positive than +2.4 VDC and less positive than +5.0 VDC.

Logic '0' Must be more positive than 0.0 VDC and less positive than +0.4 VDC.

Interface signals are active when in the Logic '1' state. Exception: Buffer clear is active in the Logic '0' state.

b. Long Line

Signals between the user and printer should be transmitted over twisted pair wire (recommended wire type; 22 AWG twisted 1 to 3 twists per inch) with a maximum recommended cable length of 150 meters.

Logic '1' Signal: Must be more positive than 2.5 VDC and less positive than +5.5 VDC.

Signal Return: Must be equal to or more positive than 0.0 VDC and less positive than 0.5 VDC.

Logic '0' Signal: Must be equal to or more positive than 0.0 VDC and less positive than +0.5 VDC.

Signal Return: Must be more positive than 2.5 VDC and less positive than +5.5 VDC.

NOTE

In the Long-Line Interface CCA, signal BUFFER CLEAR is active in the logic "1" state.

4.2.2 Interface Signals

With the printer configured with either a Short Line or Long Line Interface CCA, standard codes are received in bit-parallel form. Data transfer between the printer and the user system is on a demand/response basis. Standard interface signals recognized or generated by the printer are:

DATA STROBE	DEMAND
READY	DATA
ON LINE	

The timing relationship of these interface signals is shown in figure 4-1.

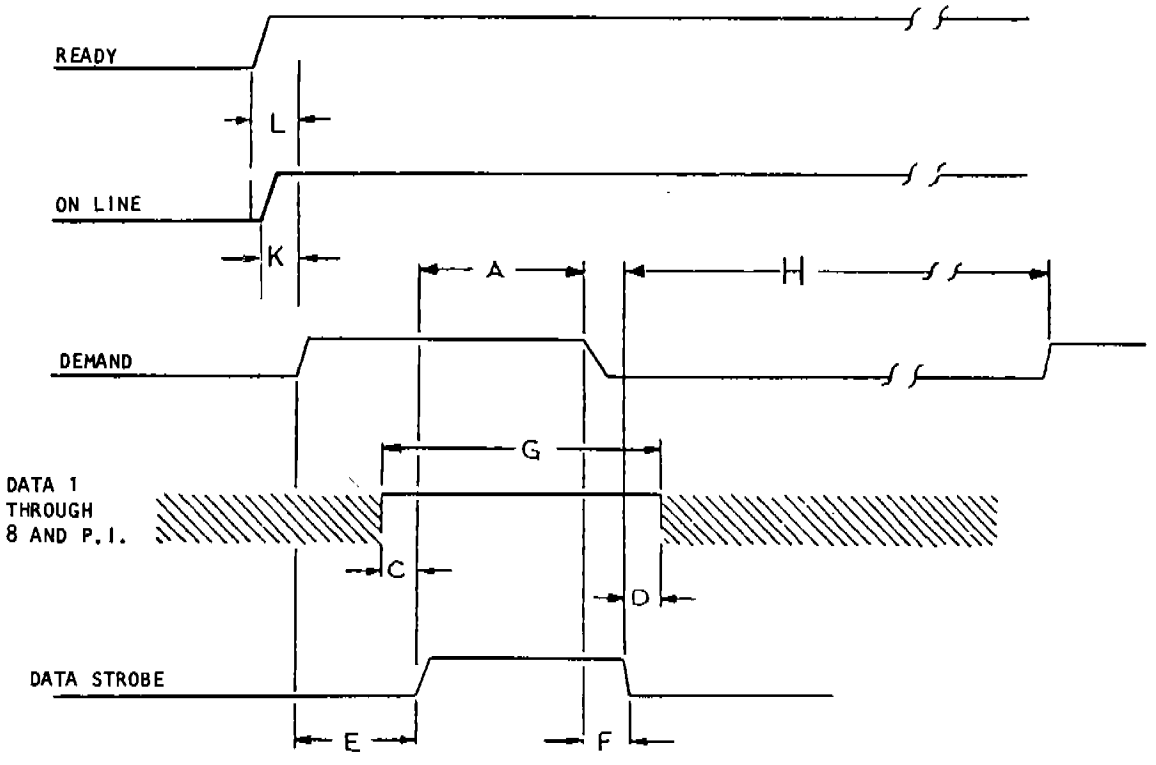
4.2.3 Interface Handshaking Operation

Interface signals operate in a handshake mode. If the printer is Ready, On Line, and able to load data, handshaking operation is as follows:

a. If the DATA STROBE signal is inactive, the DEMAND line will request data from the user and remain active until the DATA STROBE signal is received.

b. The DATA STROBE signal can go active only when DEMAND Is active and the DATA lines are stable. Once the DATA STROBE signal goes active, it must stay active while the DEMAND signal is active.

c. After the DATA lines have been sampled, DEMAND will go inactive.



Note: Waveforms measured at the Printer Interface Connector.

Note: For Maximum Throughput:

$0 < E < 0.450$ µsec.
$0 < F < 0.925$ µsec.

A = 0.550 µsec. min.
= 2.550 µsec. max.

H = 0.075 µsec. min.
= 2.075 µsec. max.

C & D = 0.050 µsec. min.

G = Data Settled

= Undefined Area

E = Greater than zero
F = Greater than zero
K = Greater than zero
L = Greater than zero

255174.109

Figure 4-1. Parallel Interface Signals, Timing Diagram

d. When the user detects that DEMAND is inactive, the DATA STROBE signal can then go inactive.

e. When the printer detects the inactive DATA STROBE signal, DEMAND is activated again.

4.2.4 Parameter Switch Setting

The Short-Line Interface CCA contains a set of switches that are used to configure the printer to the required parameters. These switches must be set, as required, prior to printer operation. Switch functions are described in table 4-1. Access to the parameter switches is gained by removing the top cover per paragraph 4.5.

TABLE 4-1. SHORT LINE INTERFACE PARAMETER SWITCH FUNCTIONS

Switch	Function	Description	ON	OFF
SW-1	Carriage Return code detect	OFF - Upon receipt of a CR code, printer will terminate data load cycle and print the line. ON - Printer will ignore any and all CR codes.	Disable	Enable
SW1-2	Not Used	Set to OFF at all times.	-	-
SW1-3	Not Used	Set to OFF at all times.	-	-
SW1-4	Not Used	Set to OFF at all times.	-	-

The Long-Line Interface contains no parameter switches.

4.2.5 Interface Hardware

The interface connector, mounted at the rear of the printer, is a 50-pin AMP Amplimite, AMP part no. 206973-1. It mates with an Amplimite connector (not supplied) AMP part no. 205212-1, used as one end of the interface cable. Contact pins for the mating connector have an AMP part no. of 66509-9.

An optional adapter cable, DPC part no. 249461-001, mates the standard interface connector of the printer with a 50-pin Winchester connector, as illustrated in figure 4-2.

Figure 4-3 shows the pin assignments and connection paths of the Parallel Interface signals connected between the Parallel Interface CCA and the 50-pin Winchester connector. A Parallel Interface Signal glossary is given in table 4-2.

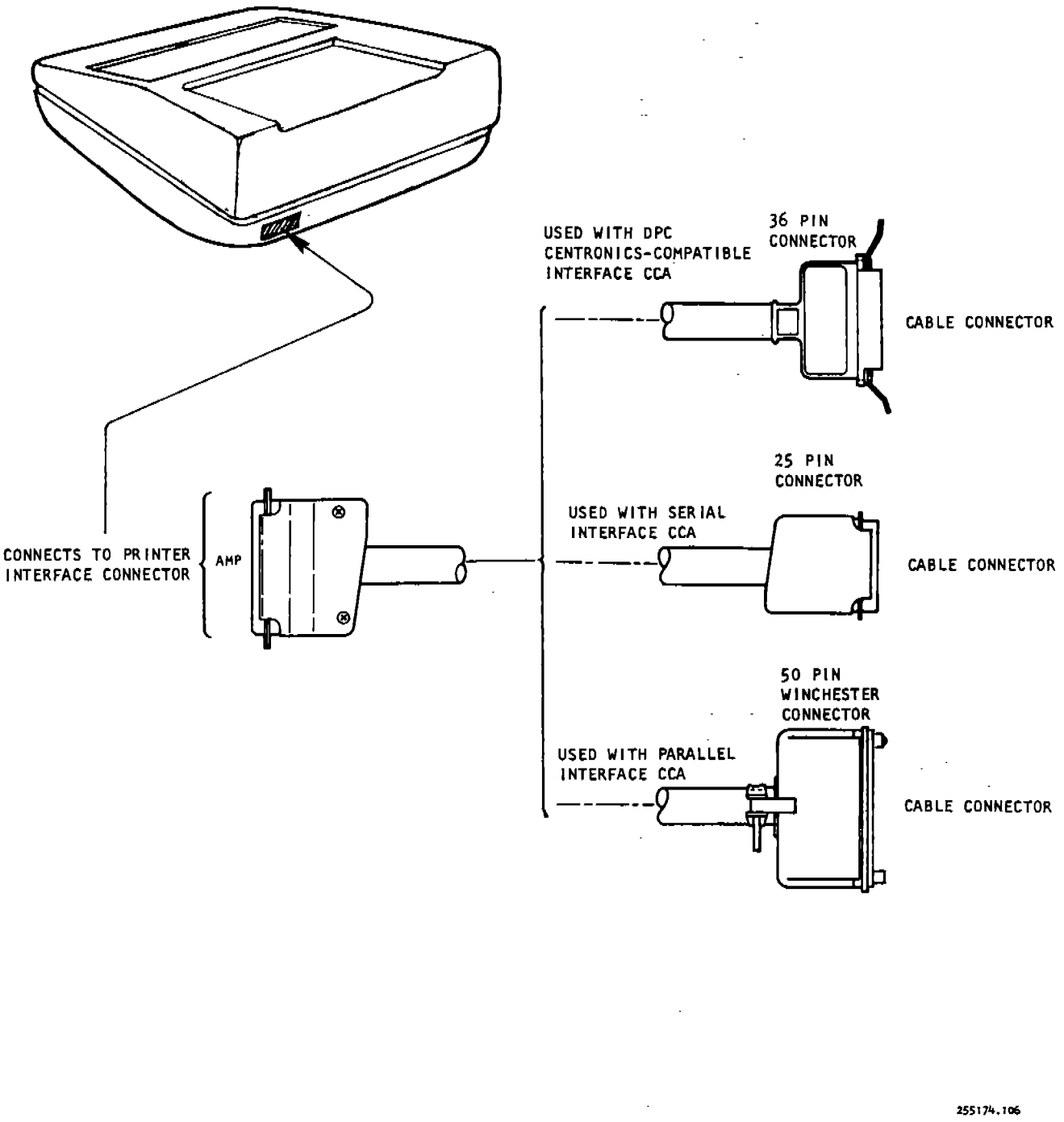


Figure 4-2. Interface Adapter Cables

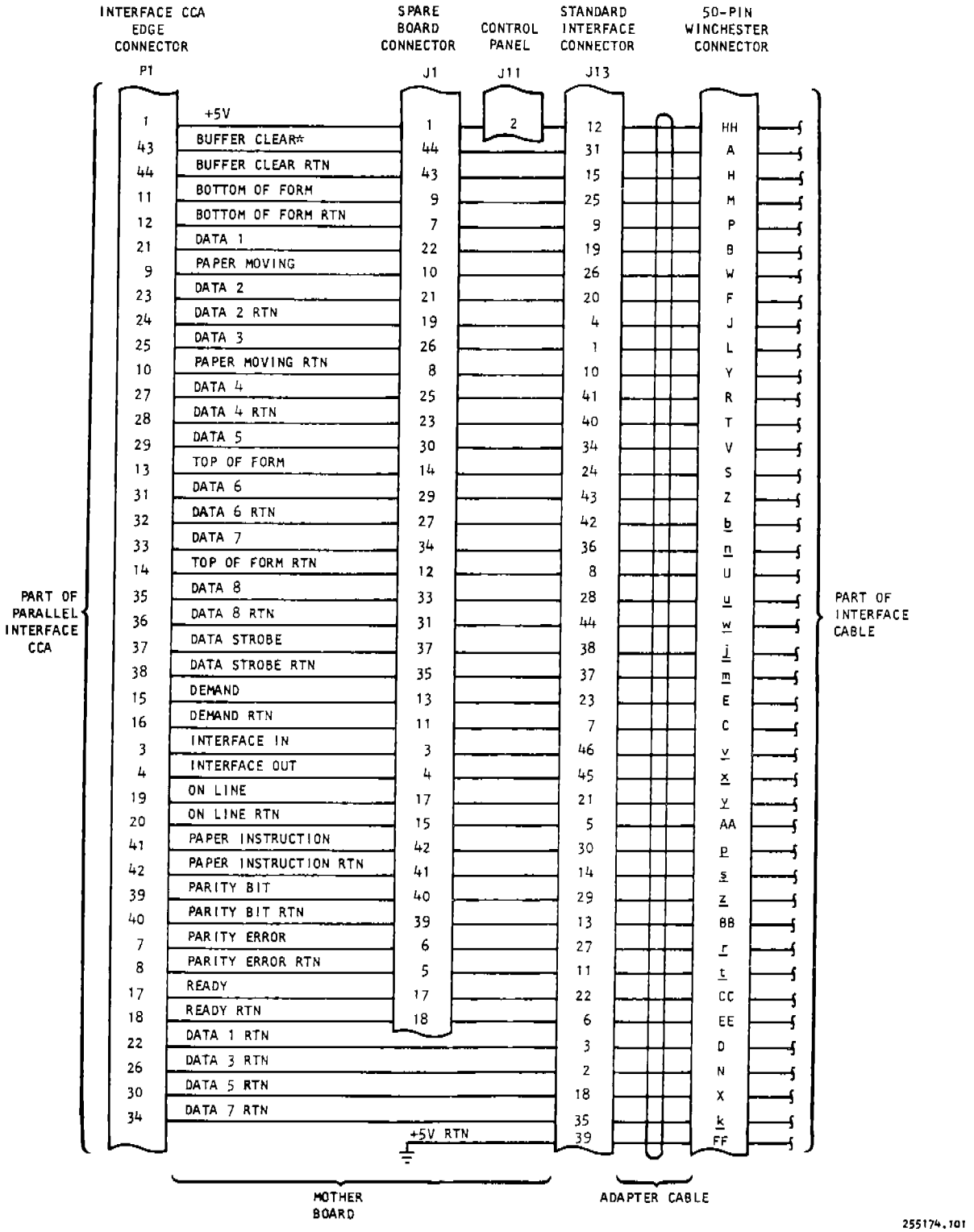


Figure 4-3. Parallel Interface CCA Pin Connection Diagram

TABLE 4-2. GLOSSARY OF SHORT AND LONG LINE PARALLEL INTERFACE CCA INTERFACE SIGNALS

Signal	Description
DATA STROBE	Strobe signal supplied by the user to the DPC Parallel Interface CCA in response to DEMAND. Validates stability of the input data bits.
DATA01 - DATA08	Input data bits supplied by the user to the DPC Parallel Interface CCA.
DEMAND	Printer-generated handshake signal supplied to the user requesting data. Raised once per character.
INTERFACE IN INTERFACE OUT	Two interface connector pins are jumpered together to allow the user to verify that the Interface CCA is plugged into the printer.
ON LINE	A printer-generated signal which indicates that the printer has been put on line. When ON LINE is active, it indicates that the following conditions have been satisfied. a. The ALARM light is off. b. The printer operator has pressed the ON LINE switch. c. The printer is ready to accept data from the user. d. SELF TEST is not selected.
PAPER INSTRUCTION	This user-generated optional signal informs the printer that information on the data lines is to be treated either as VFU format data, or as a DAVFU start or stop code.
PARITY BIT	User-supplied input to the DPC Parallel Interface CCA. When the parity option is enabled, this signal codes the odd/even bit content of the input character.
PARITY ERROR	This optional signal is generated by the printer when a parity error is detected on incoming data.
BOTTOM OF FORM	This optional signal is generated by the printer when the print station is at the bottom of form position.
BUFFER CLEAR*	When active, this user-generated signal clears the printer buffer and allows a new line of data to be loaded. Signal must be active low when a short-line Interface CCA is used, and active high when a long-line Interface CCA is used.

TABLE 4-2. GLOSSARY OF SHORT AND LONG LINE PARALLEL INTERFACE CCA INTERFACE SIGNALS (Contd)

Signal	Description
READY	A printer-generated signal which indicates that the printer is ready to be put on line. When READY is active, it indicates that the following conditions have been satisfied: a. Power and DC voltages are on. b. All interlocks are closed. c. Paper has been loaded. d. No printer fault exists. e. SELF TEST is not selected.
TOP OF FORM	This optional signal is generated by the printer when the print station is at the top of form position.
PAPER MOVING	This optional printer-generated signal informs the user that the paper feed motor is energized.

4.3 DPC CENTRONICS-COMPATIBLE INTERFACE CCA

The DPC Centronics-compatible Interface CCA accommodates short line data transmission of 49 feet (15 meters) maximum length. Standard codes are received in bit-parallel format, and data transfer between the user system and the printer is on a strobe/acknowledge format. This allows the user system to control the data transfer rate at a maximum of 75 kHz (at 75,000 characters per second). Signals between the user and the printer should be transmitted over twisted pair wires. Voltage levels for signals transmitted over this interface are defined as follows:

Logic "1" - Must be greater than +2.4 VDC and less than +5 VDC.

Logic "0" - Must be greater than 0.0 VDC and less than +0.4 VDC.

4.3.1 Interface Signals

With the printer configured with a DPC Centronics-compatible Interface CCA, standard codes are received in bit parallel form. Standard interface signals recognized or generated by the printer are:

DATA STROBE*

ACKNLG*

DATA

BUSY

4.3.2 Interface Operation and Timing

Before the printer can receive data from the user, it must first be selected. The printer can be selected one of two ways:

a. From the control panel, when the operator presses the ON LINE switch (see figure 4-4).

b. From the user, by transmitting a hexadecimal code of 11 (see figure 4-5).

Once selected, the printer can be deselected either from the control panel by the pressing of the ON LINE switch, or upon receipt of hexadecimal code of 13.

Once the printer has been selected and no BUSY condition exists, it will communicate with the user as follows (figure 4-6):

1. The user places data on the data lines and transmits a DATA STROBE* signal.

2. Sensing the DATA STROBE* signal, the Interface CCA stores the data in the line buffer and sets a delay timer.

3. At the expiration of the delay time, the Interface CCA returns an ACKNOWLEDGE* signal.

4. Sensing the ACKNOWLEDGE* signal, the user system can transmit another DATA STROBE* signal.

If the user transmits a character that causes the Interface CCA to enter the BUSY state (CR, DESELECT, or termination code), the interface communication sequence will be as follows (see figure 4-7):

1. The user system places a character on the data lines.

2. The user system transmits a DATA STROBE* signal.

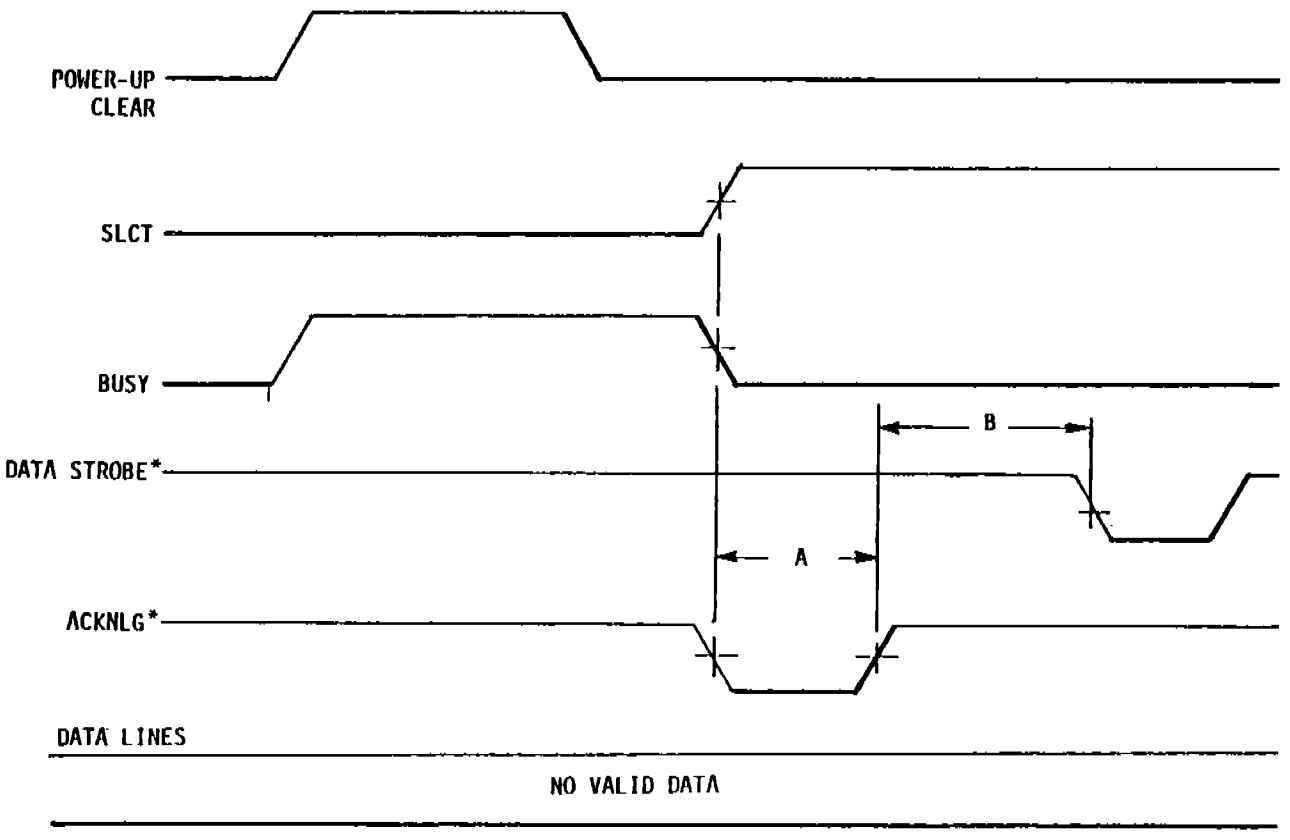
3. Sensing the leading edge of the DATA STROBE* signal, the Interface CCA decodes the character coded on the data lines.

4. After the character has been decoded, on the trailing edge of DATA STROBE*, the Interface CCA enters the BUSY state.

NOTE

If the character received is CR, BUSY is entered on the leading edge of DATA STROBE.

5. After a time delay, as determined by the type of character received, the Interface CCA terminates the BUSY state and transmits an ACKNOWLEDGE* signal to the user.



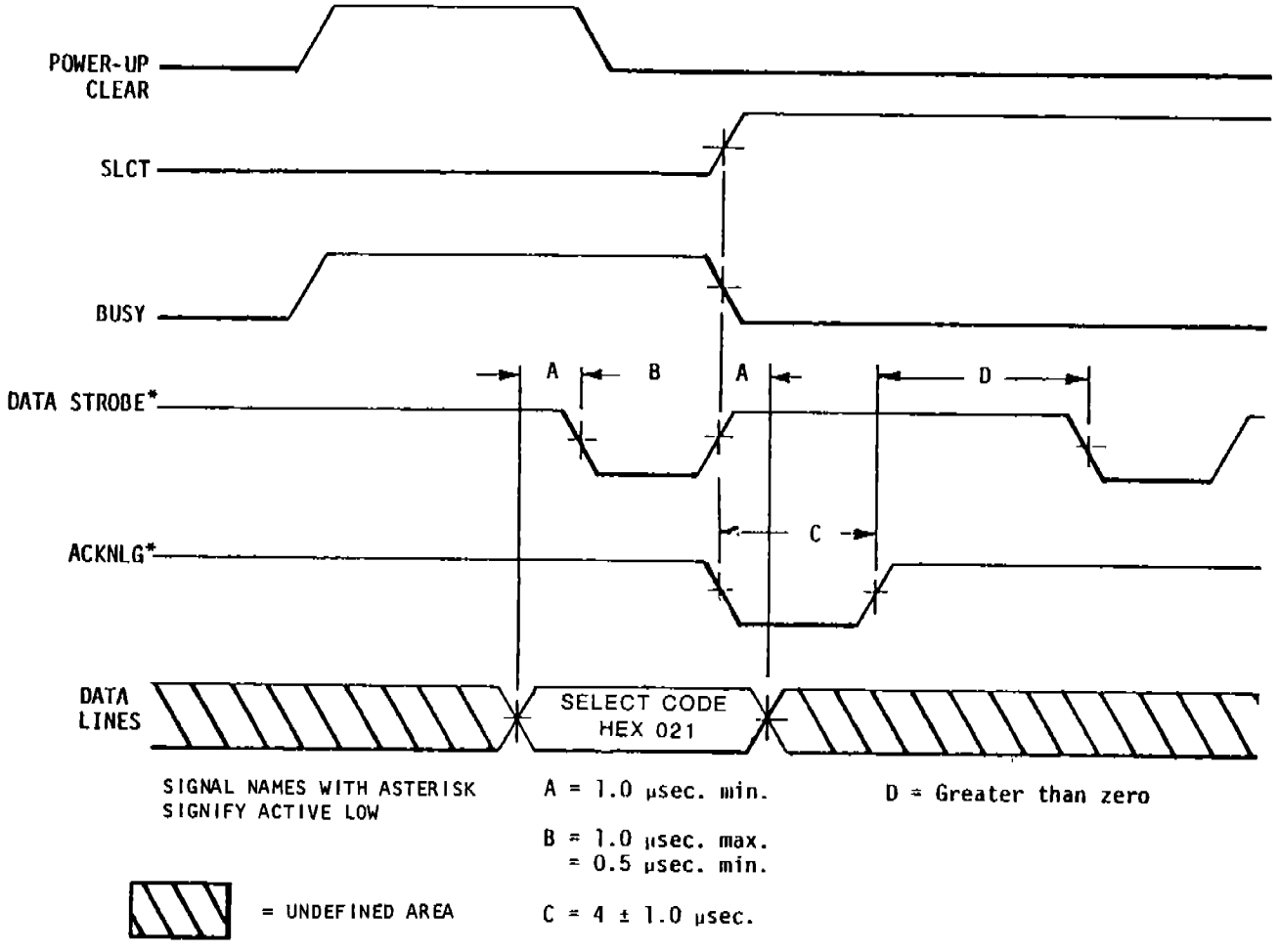
SIGNAL NAMES WITH ASTERISK
SIGNIFY ACTIVE LOW

A = 4 ± 1.0 µsec.

B = Greater than zero

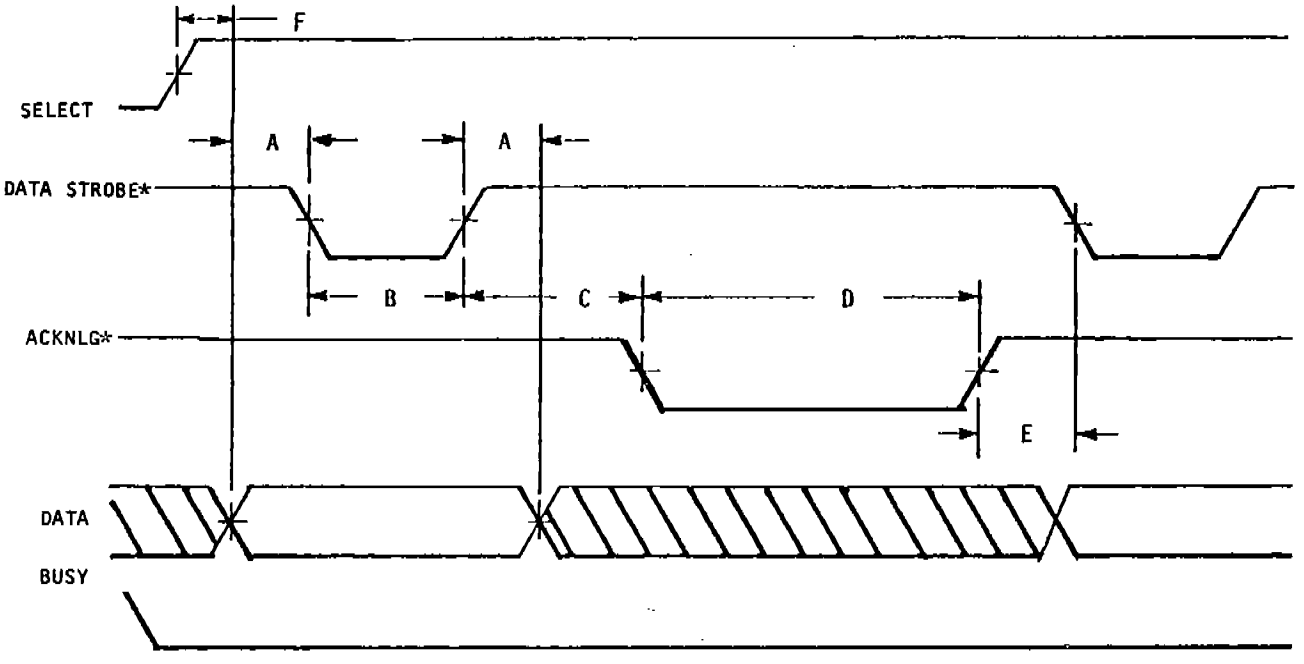
255174.110

Figure 4-4. DPC Centronics-Compatible Interface, Select Timing via On Line Switch



255174.111

Figure 4-5. DPC Centronics-Compatible Interface, Select Timing via Data Bus



Load Rate = B + C + D + E

Minimum Load Rate to maintain throughput = 100 µsec.

Time C is the Acknowledge delay

A = 1.0 µsec. min.

B = 1.0 µsec. max.
= 0.5 µsec. min.

C = 7 ± 1.2 µsec.

D = 4 ± 1.0 µsec.

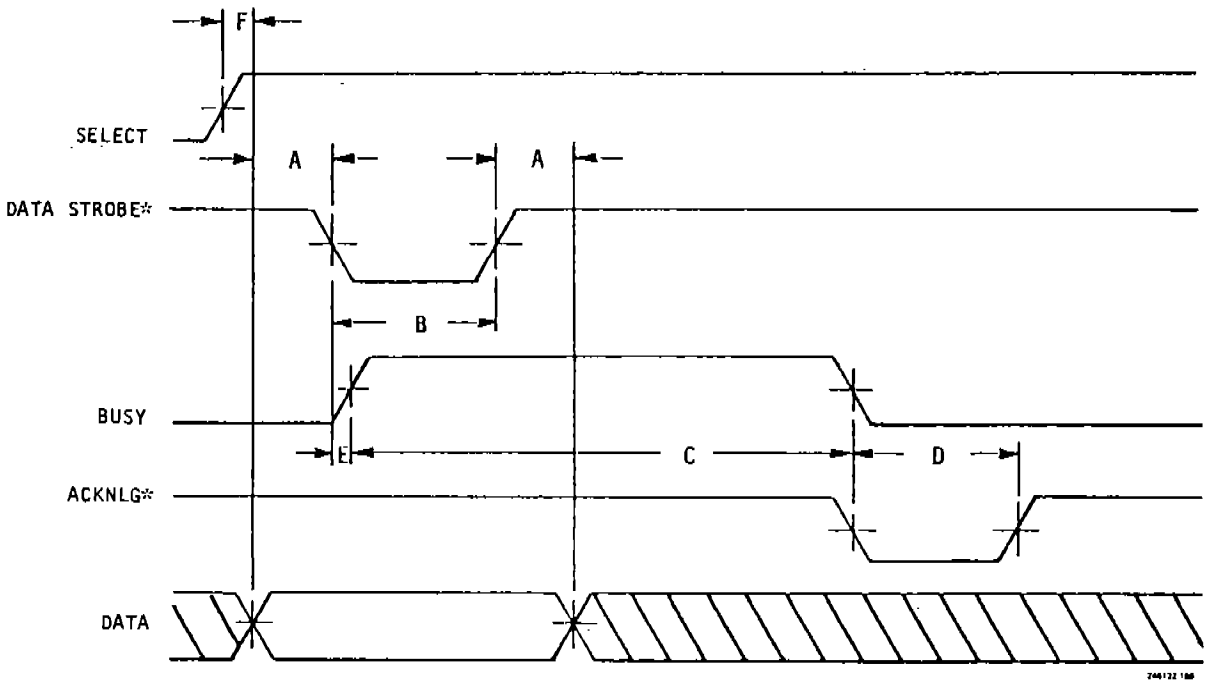
E = Greater than zero.

F = 0.0 µsec. min.
= 0.0 75 µsec. max.

= Undefined Area

255174.112

Figure 4-6. DPC Centronics-Compatible Interface, Data Transfer Timing without Busy



Received Data	Duration of Busy
1. Deselect code	Until printer is selected
2. CR W/O Auto Line	7.0 ± 1.0 µsec.
3. CR W/ Auto Line	Print + paper motion cycles
4. All Other Terminations	Print + paper motion cycles

A = 1.0 µsec. min.
B = 1.0 µsec. max.
= 0.5 µsec. min.
C = Duration of BUSY condition
D = 4.0 ± 1.0 µsec.
E = 0.0 µsec. min.
= 0.075 µsec. max.
F = Greater than zero

= UNDEFINED AREA

SIGNAL NAMES WITH ASTERISK SIGNIFY ACTIVE LOW

255174.113

Figure 4-7. DPC Centronics-Compatible Interface, Data Transfer Timing with Busy

4.3.3 Parameter Switch Setting

The DPC Centronics-compatible Interface CCA contains a set of switches that are used to configure the printer to the required parameters. These switches must be set, as required, prior to printer operation. Switch functions are described in table 4-3. Access to the parameter switches is gained by removing the top cover per paragraph 4.5.

TABLE 4-3. DPC CENTRONICS-COMPATIBLE INTERFACE CCA, PARAMETER SWITCH FUNCTIONS

Switch	Function	Description	ON	OFF
SW1-1	Not Used	Set to OFF		X
SW1-2	Auto Print	When enabled, causes printer to print automatically following receipt of the maximum number of print characters. Maximum number of print characters is either 132 or 219, depending on the position of SW1-3.	Enable	Disable
SW1-3	Maximum Line Length	ON - prints after 132 characters. OFF - prints after 219 characters. If SW1-2 is disabled, SW1-3 has no function.	132	218
SW1-4	CR Disable	ON - receipt of CR code causes printer to terminate data load cycle and print line. OFF - causes printer to ignore CR code.	Enable	Disable

4.3.4 Interface Hardware

As in all cases, the interface connector mounted at the rear of the printer is a 50-pin AMP Amplimite, AMP part no. 206973-1, that mates with AMP connector, part no. 205212-1. An optional adapter cable, DPC part no. 249526-001, mates the standard interface connector of the printer with a 36-pin AMP connector as illustrated in figure 4-2. Figure 4-8 shows the pin assignments and connection paths of the DPC Centronics-compatible Interface CCA and the 36-pin AMP connector. The Interface Signal glossary is given in table 4-4.

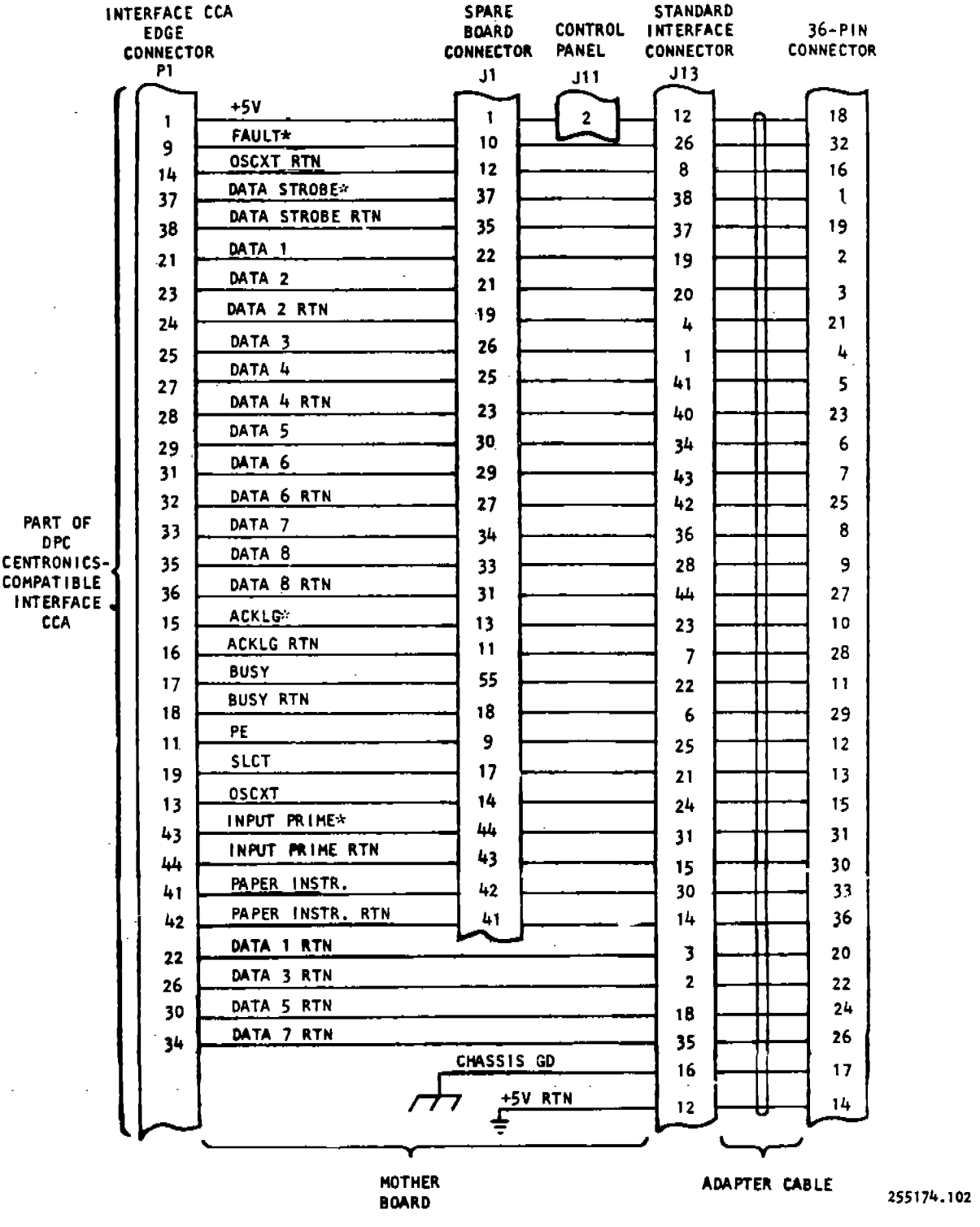


Figure 4-8. DPC Centronics-Compatible Interface CCA, Pin Connection Diagram

TABLE 4-4. GLOSSARY OF DPC CENTRONICS-COMPATIBLE INTERFACE CCA INTERFACE SIGNALS

Signal	Description
ACKNLG* (ACKNOWLEDGE)	A printer-generated signal which acknowledges that the printer has received a data word. If the data word produces a busy condition, the ACKNOWLEDGE signal will not be generated until the busy condition is cleared.
BUSY	A printer-generated signal which indicates that the printer is unable to receive print or format data. A select code can be transmitted during a busy condition.
DATA1-DATA8	8-bit bus containing data supplied by the user.
DATA STROBE*	User-generated strobe signal that validates the stability of the input data bits.
FAULT*	Printer-generated signal that indicates one of the following fault conditions: a. Printer out of paper. b. Shuttle not moving. c. Printer deselected.
INPUT PRIME*	A user-generated signal that clears the printer buffer and initializes the interface logic. The input prime signal is asynchronous to the interface logic. This signal does not affect print or paper motion cycles.
OSCXT	A printer-generated signal that transmits a 100 kHz square wave to the user.
PE	A printer-generated signal that indicates the printer is out of paper.
PI	User-supplied signal; indicates that the data bits contain either a VFU-type paper instruction or a DAVFU START or DAVFU STOP code.
SLCT (SELECT)	A printer-generated signal which indicates that the printer has been selected. When SLCT signal is active: a. The ALARM light is off. b. The printer operator has pressed the ON LINE switch, or a hex 11 code has been received via the data bus. c. The printer is ready to accept data.

4.4 SERIAL INTERFACE CCA

The Serial Interface operates in an asynchronous receive-only mode, and may be used with or without a modem. Serial data is received from the user via current loop or standard EIA RS232 receivers. The interface will operate with

a variety of baud rates ranging from 110 to 9600. In an RS232 system, signals are transmitted over a cable with the maximum length of 50 feet (15.3 meters). In a current loop system, signals are transmitted over a cable with a maximum length of 1500 feet (457 meters).

4.4.1 Logic Levels

a. RS232C

MARKING OFF (1)	SPACING ON (0)
-3.0 VDC to -25 VDC	+3.0 VDC to +25 VDC

b. 20mA Current Loop

MARKING IDLE	SPACING BREAK
17.0 mA to +20 mA	0.0 mA to 1 mA

4.4.2 Operations

The following serial interface operations are described in this paragraph:

1. POWER UP
2. DATA SEND FORMAT
3. RS232 BUSY CONDITION
4. CURRENT LOOP BUSY CONDITION

a. Power Up

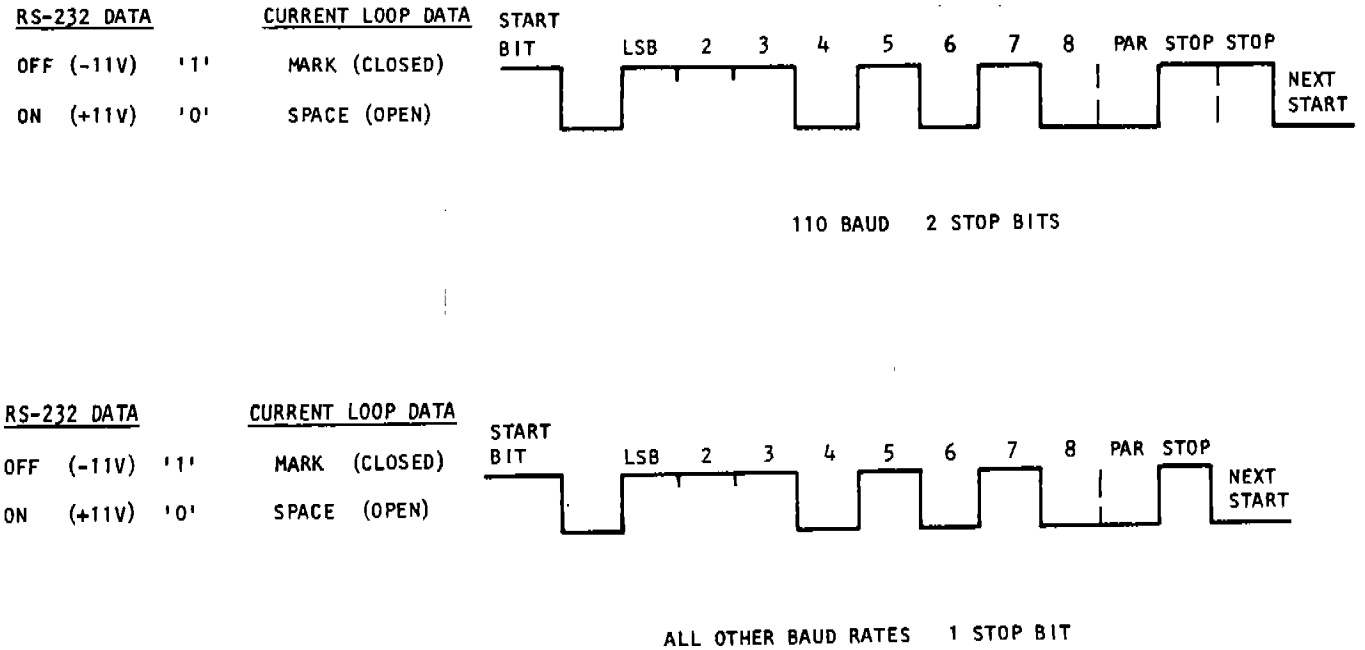
When power is first applied, the printer enters the "busy" state, and informs the interface that data cannot be accepted. In an RS232 configuration, the printer activates interface signal BUSY, and deactivates interface signal DTR (DATA TERMINAL READY). In a 20-mA current loop configuration, the printer deactivates interface signal TxD by placing it in the "break" (spacing) state.

b. Data Send Format

Following power up, and providing that no error or interlock-open conditions exist, the printer deactivates interface signal BUSY and activates interface signal DTR when in an RS232 configuration. In a 20 mA current loop configuration, the printer places interface signal TxD in a marked (closed loop) state.

The operator presses the ON LINE switch, placing the printer in the on-line state. Next, the printer informs the interface that data can now be accepted. The printer will now respond to a valid start bit, assemble the character, and check for parity, overrun and framing errors. If a parity error is detected, the character is converted to a dollar ($) sign. If a framing or overrun error is detected, the character is converted to a question (?) mark. Valid as well as converted characters are then stored in a buffer. Refer to figure 4-9 for serial word formatting.

Data is loaded in a continuous flow, and a paper motion command must be transmitted after not more than 132 standard-pitch print characters or 218 condensed-pitch print characters. A terminating code is required no later



NOTE: SAMPLE CHARACTER W = 057_{16}
ODD PARITY.

255174.114

Figure 4-9. Serial Interface-Data Word Format

than the 133rd, standard-pitch or 219th condensed-pitch print character. Print characters in excess of 132/218 will not be stored in the print buffer.

Whenever a paper motion command is detected, print data received prior to paper motion command is printed, and the paper motion command is executed. The interface can continue loading new data while printing and paper motion are occurring, as long as the buffer is not full. As a warning to the user, a busy condition will be generated when the print buffer becomes 3/4 full. Figure 4-10 illustrates the timing relationship between the BUSY and the DATA TERMINAL READY signals.

c. RS232 Busy Condition

If the BUSY signal goes to a spacing (ON) condition during the transmission of a line of data, the user should stop loading within 250 characters, and hold the RECEIVED DATA signal (RxD) in a marking (OFF) condition before transmitting data. If this procedure is not followed and the print buffer is allowed to be fully loaded, the DTR signal will go to a marking (OFF) condition and prevent further data from being loaded. If a print line is only partially loaded when the DATA TERMINAL READY signal goes into a marking (OFF) condition, this incomplete line will be lost.

d. Current Loop Busy Condition

The printer will transmit a BREAK signal to the user, advising to stop loading immediately following receipt of the next paper motion command.

e. Asynchronous/Synchronous Busy Status Change

On printers configured with a standard "asynchronous" Serial Interface CCA, the busy signal will change states some undetermined time after the input buffer becomes 3/4 full.

A "synchronous" Serial Interface CCA is offered as an option. In printers configured with a "synchronous" Serial Interface CCA, the busy signal is synchronized with the stop bit time of any given received character. Specifically, the BUSY signal transition, if applicable, will occur within 20 microseconds after the midpoint of the first stop bit of a given character as measured at the printer interface connector. Note: In printers configured with a synchronous Serial Interface CCA, the DAVFU option cannot be implemented.

f. X-ON/X-OFF

This is an alternate method used to indicate whether or not the printer is in the "busy" condition Unlike the BUSY signal, which is denoted by a level change on the BUSY line, X-ON and X-OFF ARE ASCII-coded signals The hexadecimal code for X-ON (BUSY*) is 11, and for X-OFF (BUSY) is 13. Figure 4-11 shows the relationship of X-ON/X-OFF with respect to DTR.

4.4.3 Parameter Switch Settings

The Serial Interface CCA contains a set of switches that are used to configure the printer to the required parameters. These switches must be set, as

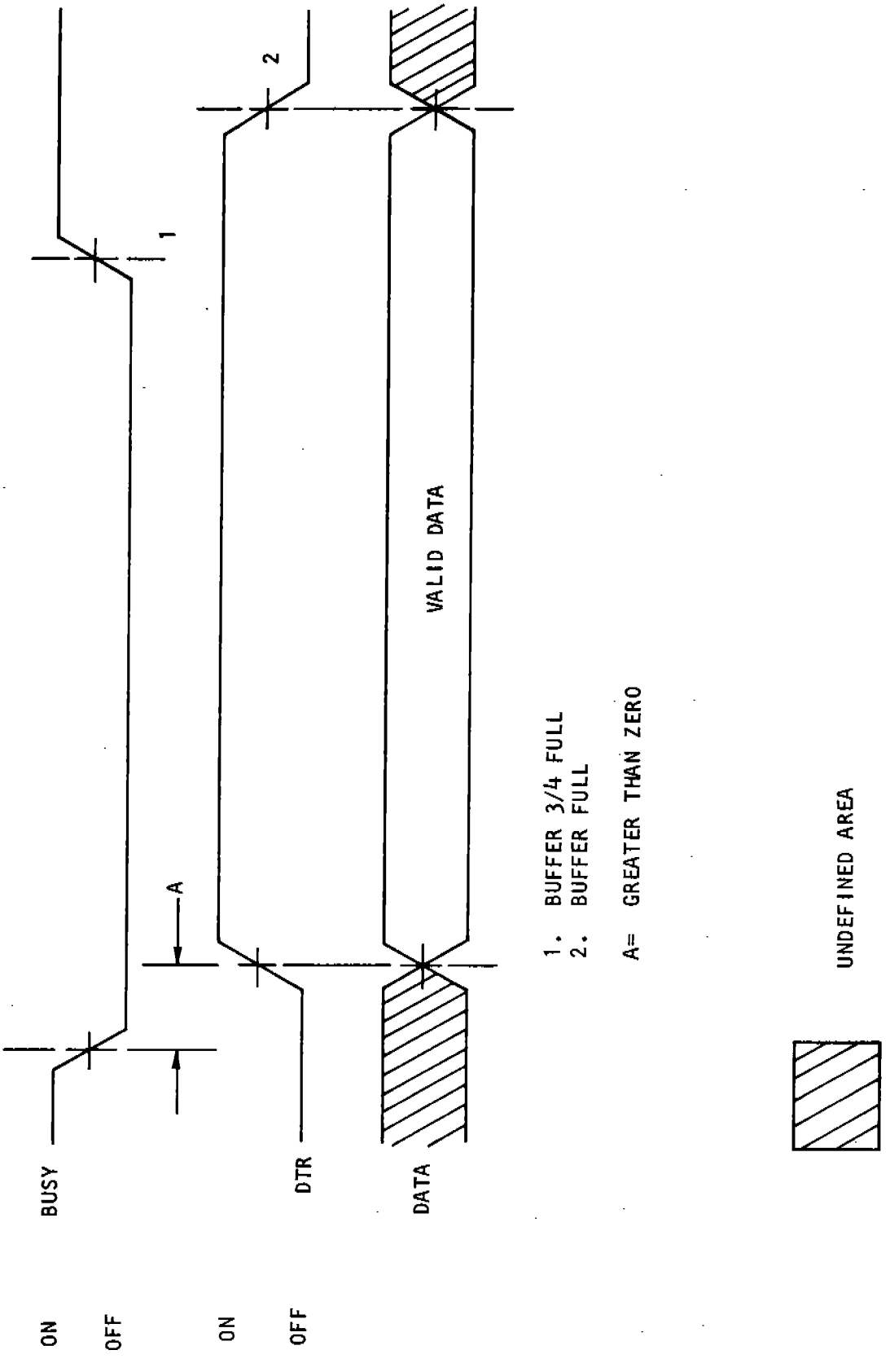


Figure 4-10. Serial Interface Busy/DTR Timing

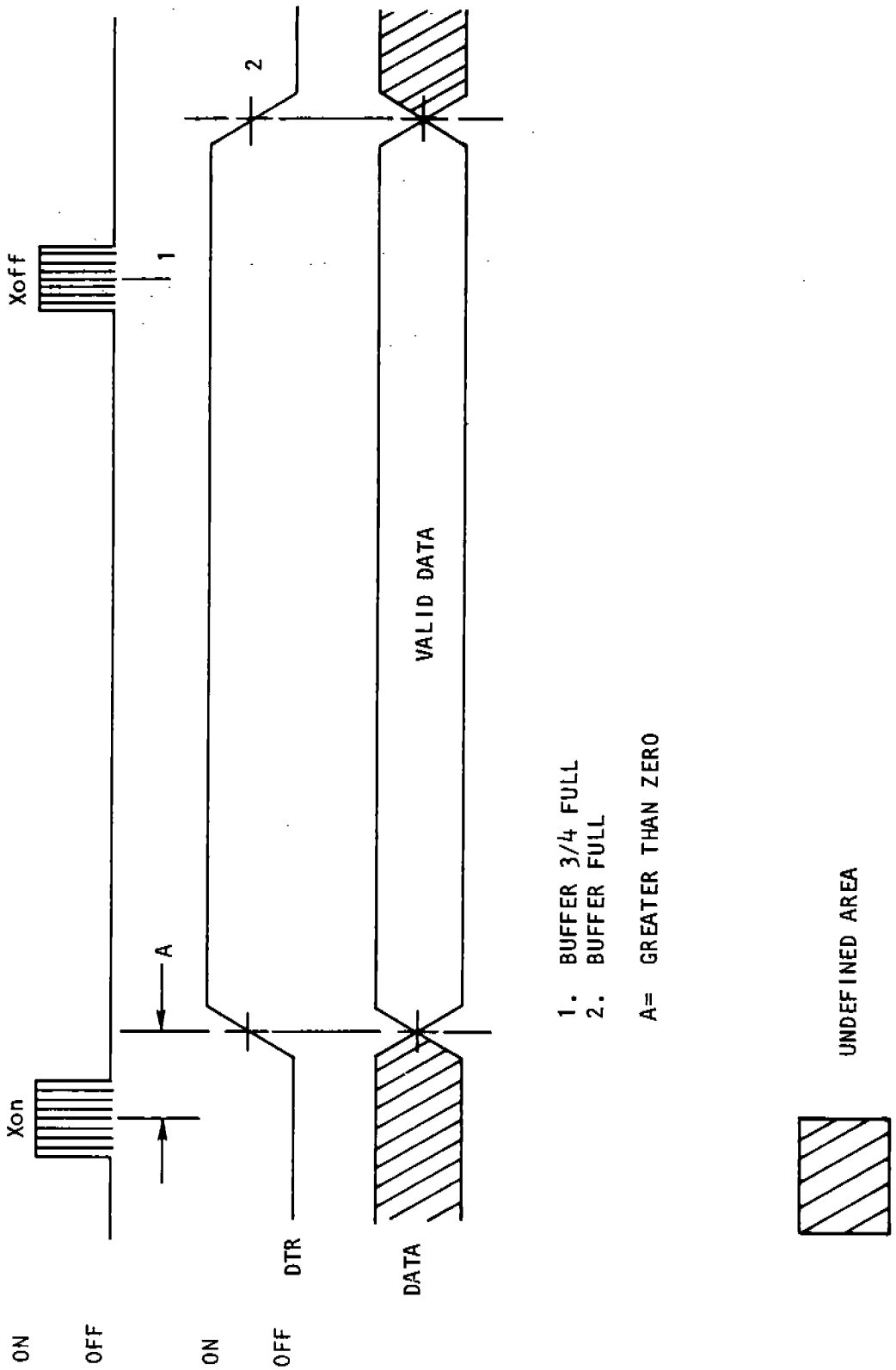


Figure 4-11. Serial Interface - TxD/DTR Timing

required, prior to printer operation. Switch functions are described in table 4-5. Access to the parameter switches is gained by removing the top cover per paragraph 4.5.

4.4.4 Interface Hardware

As in all cases, the interface connector mounted at the rear of the printer is a 50-pin AMP Amplimite, AMP part no. 206973-1, that mates with AMP connector, part no. 205212-1. An optional adapter cable, DPC part no. 249462-001, mates the standard interface connector of the printer with a 25-pin AMP connector as illustrated in figure 4-2. Figure 4-10 shows the pin assignments and connection paths of the Serial Interface CCA and the 25-pin AMP connector. Interface signal glossary is given in table 4-6.

TABLE 4-5. SERIAL INTERFACE CCA PARAMETER SWITCH SETTINGS

STOP BIT/STATUS SELECT SWITCHES SW1-1, SW1-2				
Switch	Function	Description	On	Off
SW1-1	Stop Bit Select	Switch is set to either on or off, depending on the number of stop bits contained in each serial word	One stop bit	Two stop bits
SW1-2	Status	For standard operation, switch must be set to on (disable)	Disable	Enable

TxD/BUSY FUNCTION SELECT SWITCHES SW1-3, SW1-4				
SW1-3	SW1-4	Output of Interface Connector		
		Current Loop TxD+ / TxD-	RS232 TxD	RS232 BUSY
ON	ON	X-ON (Hex 11) / X-OFF (Hex 13)	X-ON, X-OFF Code	BUSY high true
OFF	ON	X-ON / X-OFF	X-ON, X-OFF Code	BUSY low true
ON	OFF	BUSY open loop	BUSY high true	BUSY high true
OFF	OFF	BUSY closed loop	BUSY low true	BUSY low true

MODE SELECT SWITCHES SW2-1 THRU SW2-4				
Switch	Function	Description	On	Off
SW2-1	Carrier Detect	Enabled - requires user control	Disable	Enable
SW2-2	Mode Select	Current loop or RS232	RS232	Current Loop
SW2-3	Data Set Ready	Enabled - requires user control	Disable	Enable
SW2-4	Clear to Send	Enabled - requires user control	Disable	Enable

BAUD RATE SELECT SWITCHES SW3-1 THRU SW 3-4														
	Baud Rate													
Switch	50	75	110	134.5	150	300	600	1200	1800	2400	3600	4800	7200	9600
SW3-1	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	ON	OFF	ON	OFF	ON	OFF
SW3-2	ON	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	ON	ON	OFF	OFF
SW3-3	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
SW3-4	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF

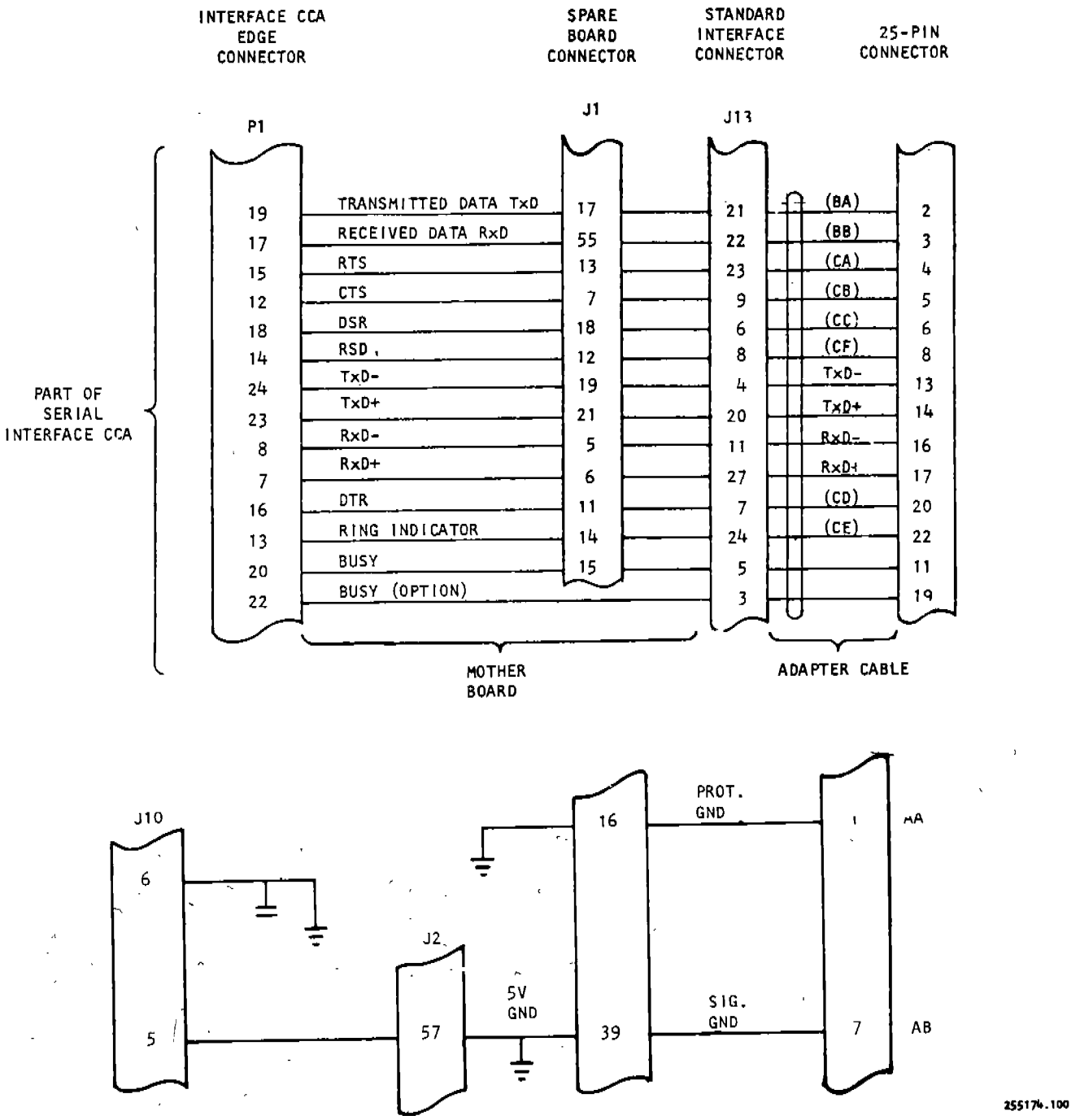


Figure 4-12. Serial Interface CCA, Pin Connection Diagram

TABLE 4-6. GLOSSARY OF SERIAL INTERFACE CCA INTERFACE SIGNALS

Signal	Description
(AA)	Protective Ground - This conductor is electronically connected to signal ground (AB).
(BA)	Transmitted Data - This printer-generated signal transmits control information to the user system. The printer cannot transmit unless an on condition is present on all the following signals: (1) Request to Send (CA) (2) Clear to Send (CB) (3) Data Set Ready (CC) (4) Data Terminal Ready (CD)
(BB)	Received Data - This user-generated signal transmits all print, format and control code information to the printer. This signal will only be looked at when the following signals are in the ON condition: (1) Data Terminal Ready (2) Data Set Ready (Optional) (3) Received Line Signal Detector (Optional)
(CA)	Request to Send - This printer-generated signal is held in the OFF condition to maintain the printer in the receive-only mode.
(CB)	Clear to Send - This user-generated signal indicates that the user system is ready to receive data.
(CC)	Data Set Ready - This user-generated signal indicates the status of the user equipment. The off condition of the DSR signal indicates that the printer must disregard signals on the other interface lines. The on condition indicates that the user equipment is in a ready condition.
(AB)	Signal Ground - This conductor establishes the common ground reference potential for all interface circuits. Signals ground (AB) and protective ground (AA) are connected together in the printer by a capacitor.
(CF)	Received Line Signal Detector - this user-generated signal, when in the ON condition, indicates that the data communication equipment is receiving a signal (from the signal source) which meets its suitability criteria. These criteria are established by the data communication equipment manual.

TABLE 4-6. GLOSSARY OF SERIAL INTERFACE CCA INTERFACE SIGNALS (Contd)

Signal	Definition
BUSY	This printer-generated signal is used to send status to the user. BUSY will be in the ON condition whenever: (1) Data Terminal Ready is in the OFF condition. (2) The print buffer is more than 3/4 full. Data loading can continue after the BUSY signal goes active; however, any data transmitted after the buffer is full will not be stored in the printer and the DTR signal will go OFF.
(TxD-)	Transmit Data Minus - This signal is the current loop return for Transmit Data.
(TxD+)	Transmit Data Plus - This printer-generated signal indicates that the printer is able to receive data. Current is allowed to flow in the transmit loop when: (1) Printer power is ON. (2) No printer faults exist. (3) Printer has been placed on line. (4) Print buffer is not full. (5) Printer is not BUSY. This pin is positive with respect to (TxD-) when loop current is flowing.
(RxD-)	Receive Data Minus - This signal is in the current loop return for Receive Data.
(RxD+)	Receive Data Plus - This user-generated signal transmits all print and control code information to the printer. This pin is positive with respect to RxD- when loop current is flowing. This signal also indicates the status of the user equipment. Current is to be maintained in the loop, except while data is being transmitted, to indicate that the user equipment is in a ready condition. The absence of loop current for the period of one full transmission character will be interpreted by the printer as BREAK, indicating that the user equipment is not in a ready condition.

TABLE 4-6. GLOSSARY OF SERIAL INTERFACE CCA INTERFACE SIGNALS (Contd)

Signal	Definition
(CD)	Data Terminal Ready - DTR - This printer-generated signal indicates that the printer is able to receive data. This signal is ON when: (1) Printer power is ON. (2) No printer faults exist. (3) Printer is on line. (4) Print buffer is not full. If the DTR signal goes OFF due to a Paper Out condition, it is possible that valid data may still be stored in the printer buffer. In order to print the remaining data, paper must be reloaded and the on line mode re-entered via the ON LINE control panel switch. Any data remaining in the buffer will be printed and the printer will receive more data.
(CE)	Ring Indicator - This user-generated signal indicates that a ringing signal is being received by the printer. When this signal is in the on condition, it will activate the Data Terminal Ready line on the first ring. The printer must be powered up, ready, and on line.

4.5 ACCESSING THE INTERFACE CCA PARAMETER SWITCHES (Figure 4-13)

To gain access to the parameter switches, it is necessary to remove the top cover first, followed by the removal of the Interface CCA. Note that the top cover is fastened to the base by two recessed screws at the front and by two quick-release latches at the rear. In addition, the top cover houses the control panel, which is fastened by a spring-loaded clip and must be detached for top cover removal. The removal procedure is as follows:

a. Disconnect the power plug from the power source

WARNING

Do not attempt to perform any removal/replacement procedures with the power plug connected to the power source.

b. Raise the door assembly to gain access to the two screws securing the top cover at the front.

c. Loosen and remove the left and right recessed mounting screws at the front of the printer.

CAUTION

When performing step d, be careful not to apply any tension to the control panel harness.

d. Unlatch the two quick-release latches at the rear and set the cover on its right side.

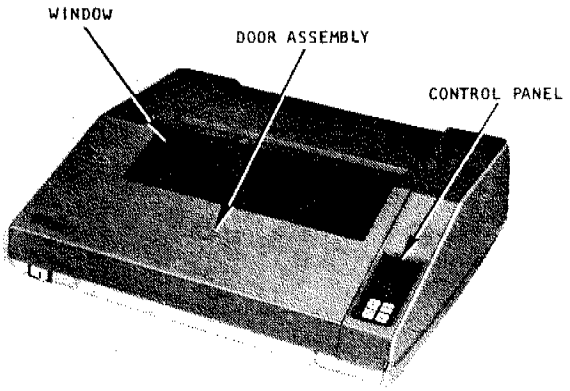
e. While maintaining pressure on the retaining clip with one hand, grasp the control panel with the other hand (figure 4-13c), and pull down. Top cover is now free to be removed.

f. Set the top cover on a convenient flat surface.

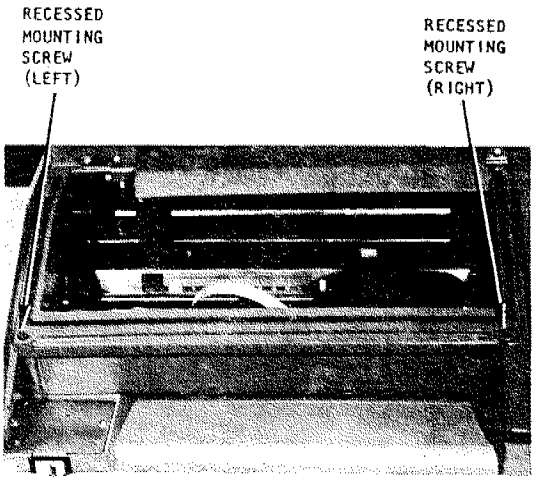
g. Place the control panel within the housing on the right side of the printer base assembly so that the two holes on the control panel circuit card assembly fit over the two molded pins.

h. Unplug the Interface CCA from its dual mating socket P1/P2 (figure 4-14). The parameter switches are now accessible.

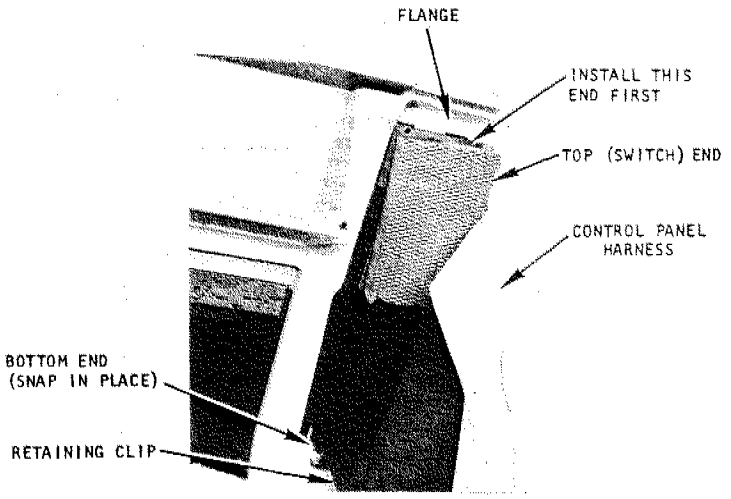
i. To replace, insert the Interface CCA into its dual mating socket P1/P2.



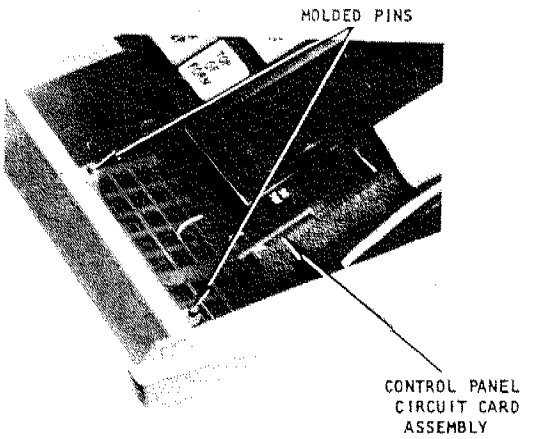
A. DOOR ASSEMBLY CLOSED



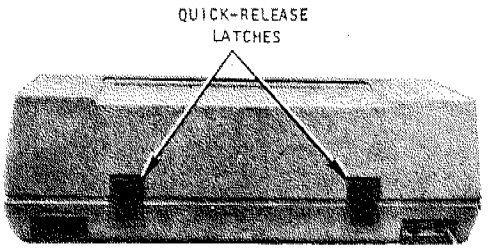
B. DOOR ASSEMBLY RAISED



C. CONTROL PANEL MOUNTING DETAILS (VIEWED FROM INSIDE OF TOP COVER)



D. CONTROL PANEL PLACEMENT FOLLOWING REMOVAL



E. REAR VIEW

Figure 4-13. Parameter Switch Access

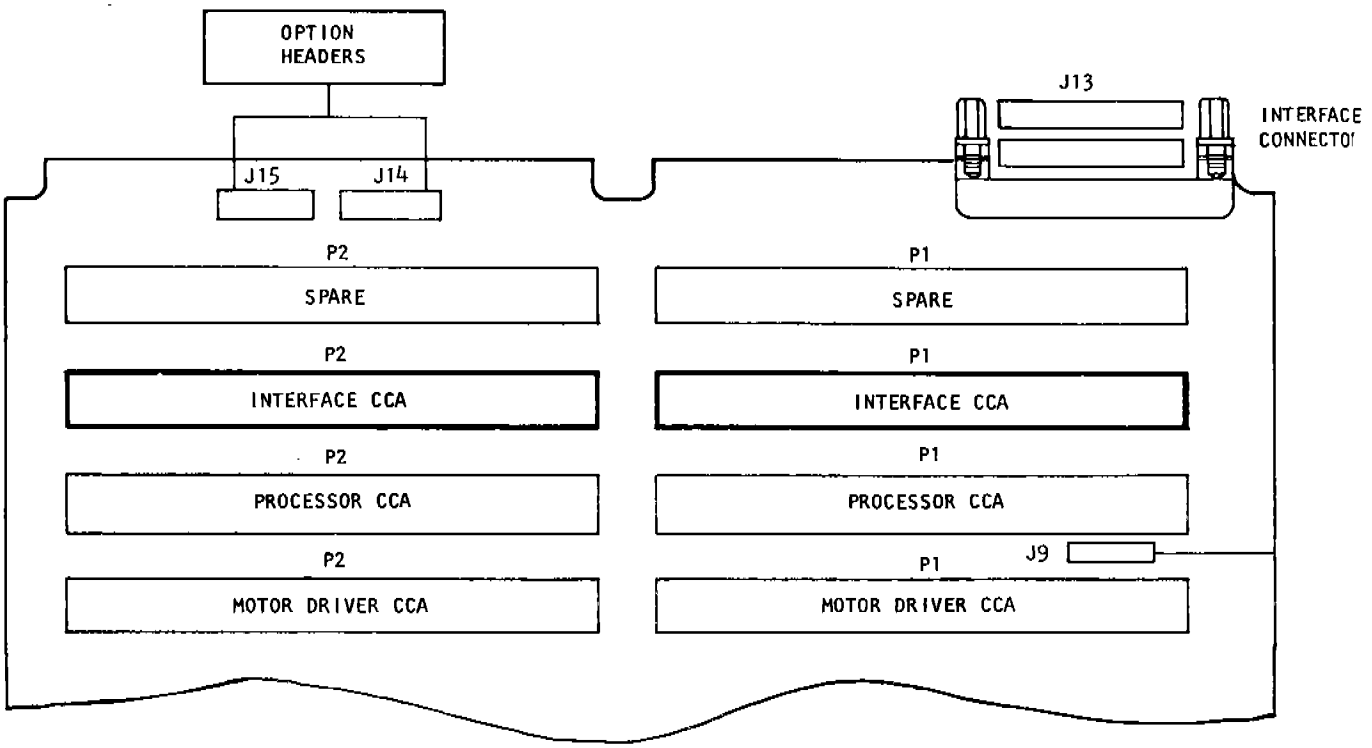


Figure 4-14. Interface CCA Locator

j. Top Cover Replacement

Replace the top cover, as follows:

1. Raise the front of the top cover and install the control panel inside the top cover. To do so, orient the control panel so that the cable harness is on the outside, and the pushbutton switches are at the top. Insert the top end of the control panel within the top cover opening with the edge of the control panel resting on the flange. Finally, press the bottom end of the control panel against the spring tension of the retaining clip and snap in place.

2. Slowly lower the top cover over the printer. Make sure that the control panel harness is not pinched between the top cover and the printer base.

3. Align the top cover at the front and rear, fasten the two quick release latches at the rear, and secure the two retaining screws at the front.

4. Close the door assembly.

SECTION V

CONTROL CODES AND ASCII CODES

5.1 INTRODUCTION

This section defines the printer response to the control codes used in the M-Series printers, and lists the printable ASCII-coded characters used in the M120 and M200 printers.

5.2 CONTROL CODE DEFINITIONS

Table 5-1 lists the control characters by binary code and mnemonic, and defines the printer response to each control character.

TABLE 5-1. CONTROL CODE DEFINITIONS

Bits								Mnemonic	Printer Response
B8	B7	B6	B5	B4	B3	B2	B1		
0	0	0	0	0	0	0	0	NUL	Printer will ignore a null code
0	0	0	0	0	0	0	1	SOH	Printer will print a space
0	0	0	0	0	0	1	0	STX	Printer will print a space
0	0	0	0	0	0	1	1	ETX	Printer will print a space
0	0	0	0	0	1	0	0	EOT	Printer will print a space
0	0	0	0	0	1	0	1	ENQ	Printer will print a space
0	0	0	0	0	1	1	0	ACK	Printer will print a space
0	0	0	0	0	1	1	1	BEL	Printer will print a space
0	0	0	0	1	0	0	0	BS	Printer will print a space
0	0	0	0	1	0	0	1	HT	Printer will print a space
0	0	0	0	1	0	1	0	LF	Printer will terminate the data transfer, print the line, advance paper one line
0	0	0	0	1	0	1	1	VT	Printer will print a space
0	0	0	0	1	1	0	0	FF	Printer will terminate the data transfer, print the line, advance paper to the top of the next form
0	0	0	0	1	1	0	1	CR	Printer will terminate the data transfer, print the line
0	0	0	0	1	1	1	0	S0	Printer will print the current line in expanded characters
0	0	0	0	1	1	1	1	S1	Printer will print a space
0	0	0	1	0	0	0	0	DLE	Printer will print a space
0	0	0	1	0	0	0	1	DC1*	Select code recognized by printers configured with a DPC Centronics-compatible Interface CCA. See paragraph 4.3.2
0	0	0	1	0	0	1	0	DC2	Select code for condensed printing. See paragraph 6.2.1.

TABLE 5-1. CONTROL CODE DEFINITIONS (Contd)

Bits B8	B7	B6	B5	B4	B3	B2	B1	Mnemonic	Printer Response
0	0	0	1	0	0	1	1	DC3**	Deselect code recognized by printers configured with a DPC Centronics-compatible Interface CCA. See paragraph 4.3.2
0	0	0	1	0	1	0	0	DC4	Printer will print a space
0	0	0	1	0	1	0	1	NAK	Printer will print a space
0	0	0	1	0	1	1	0	SYN	Printer will print a space
0	0	0	1	0	1	1	1	ETB	Printer will print a space
0	0	0	1	1	0	0	0	CAN	Printer will print a space
0	0	0	1	1	0	0	1	EM	Printer will print a space
0	0	0	1	1	0	1	0	SUB	Printer will print a space
0	0	0	1	1	0	1	1	ESC	Printer will print a space
0	0	0	1	1	1	0	0	FS	Printer will print a space
0	0	0	1	1	1	0	1	GS	Printer will print a space
0	0	0	1	1	1	1	0	RS	Printer will print a space
0	0	0	1	1	1	1	1	US	Printer will print a space
0	1	1	1	1	1	1	1	DEL	Printer will ignore a DEL code

* When the printer is configured with a Serial Interface CCA, the mnemonic term for Hex code 11 is X-ON. Code X-ON is transmitted by the printer to the user to indicate that the printer is able to receive data.

** When the printer is configured with a Serial Interface CCA, the mnemonic term for Hex code 13 is X-OFF. Code X-OFF is transmitted by the printer to the user to indicate that the printer is unable to receive data.

5.3 CHARACTER SETS

Tables 5-2 and 5-3 list the available character sets for the M120 and M200 printers. Note that each character set is implemented by a unique character generator PROM in the Processor CCA. To change from one character set to another, the character generator PROM must be changed.

TABLE 5-2. STANDARD M120/200 CHARACTER SET

B8 B7 B6 B5 / B4 B3 B2 B1	0 0 1 0	0 0 1 1	0 1 0 0	0 1 0 1	0 1 1 0	0 1 1 1	1 0 0 0	1 0 0 1
0 0 0 0	Space	0	@	P	`	p	£	Ã
0 0 0 1	!	1	A	Q	a	q	¡	Ñ
0 0 1 0	"	2	B	R	b	r	¤	Ö
0 0 1 1	#	3	C	S	c	s	é	ø
0 1 0 0	$	4	D	T	d	t	ü	õ
0 1 0 1	%	5	E	U	e	u	ß	β
0 1 1 0	&	6	F	V	f	v	¥	ü
0 1 1 1	'	7	G	W	g	w	¬	õ
1 0 0 0	(	8	H	X	h	x	Ö	¢
1 0 0 1	)	9	I	Y	i	y	ø	ä
1 0 1 0	*	:	J	Z	j	z	ù	á
1 0 1 1	+	;	K	[	k	{	ñ	å
1 1 0 0	,	<	L	\	l	¦	/	§
1 1 0 1	-	=	M	]	m	}	ā	É
1 1 1 0	.	>	N	^	n	~	Æ	Æ
1 1 1 1	/	?	O	_	o	Space	Ä	ç

TABLE 5-3. ALTERNATE LOWER CASE M200 CHARACTER SET

B8 B7 B6 B5 / B4 B3 B2 B1	0 0 1 0	0 0 1 1	0 1 0 0	0 1 0 1	0 1 1 0	0 1 1 1	1 0 0 0	1 0 0 1
0 0 0 0	Space	0	@	P	`	p	£	Ã
0 0 0 1	!	1	A	Q	a	q	¡	Ñ
0 0 1 0	"	2	B	R	b	r	¤	Ö
0 0 1 1	#	3	C	S	c	s	é	ø
0 1 0 0	$	4	D	T	d	t	ü	õ
0 1 0 1	%	5	E	U	e	u	¿	ß
0 1 1 0	&	6	F	V	f	v	¥	ü
0 1 1 1	'	7	G	W	g	w	¬	õ
1 0 0 0	(	8	H	X	h	x	ö	¢
1 0 0 1	)	9	I	Y	i	y	ø	ä
1 0 1 0	*	:	J	Z	j	z	ù	à
1 0 1 1	+	;	K	[	k	{	ñ	ã
1 1 0 0	,	<	L	\	l	¦	~	§
1 1 0 1	-	=	M	]	m	}	ā	É
1 1 1 0	.	>	N	^	n	~	Æ	Ã
1 1 1 1	/	?	O	_	o	Space	Ä	Ç

SECTION VI

OPTIONS

6.1 INTRODUCTION

This section contains user information on three optional items: Option Header; Tape controlled VFU (TCVFU); and Direct Access VFU (DAVFU).

6.2 OPTION HEADER

The option header provides the means for configuring the printer with one or more options, as follows:

a. Condensed Print

b. Direct Access Vertical Format Unit (DAVFU)

c. Tape Controlled Vertical Format Unit (TCVFU)

d. Parity Error Detect Enable

e. Parity Odd/Even

f. Fixed Perforation Skipover

g. 11/12 Inch Forms Length

h. Automatic Line Feed

i. Seven Bits Only Word Length

6.2.1 Description of Options

The following is a description of options selected by the Option Header:

a. Condensed Print

With this option enabled, the user may program condensed printing (16.7 CPI) on a line-by-line basis. To do this, the user transmits a hexadecimal code of 12 after the last printable character in the line, and just prior to the control code for that line. With this jumper out, condensed printing is disabled and cannot be programmed by the user. Note that, with this jumper in or out, condensed printing may be selected manually by setting the optional PITCH switch to 16.

NOTE

In some model printers, the option header is replaced by DIP switches. Placing a switch to the ON position is equivalent to installing a jumper wire in the option header.

b. Direct Access Vertical Format Unit (DAVFU) Enable

With this option enabled, the user may transmit a vertical formatting pattern into printer memory over the lines normally reserved for print and paper motion data (see paragraph 6.4).

c. Tape Controlled Vertical Format Unit (TCVFU) Enable

With the optional TCVFU installed (see paragraph 6.3) enabling of this option allows the user to transmit non-ASCII-coded paper motion characters in a format corresponding to the pattern punched on the paper tape.

d. Parity Error Detect Enable

With this option enabled, and the printer configured with either a Short-line or Long-line Parallel Interface CCA, the printer will respond to a parity error detected on a character by printing a space for that character and transmitting a parity error signal to the user. A parity error condition is reset upon receipt of either a buffer clear signal or any format code.

With this option enabled, and the printer configured with a Serial Interface CCA, the printer will respond to a parity error detected on a character by printing a dollar sign ($) for that character. There is no parity error signal returned to the user.

Printers configured with a DPC Centronics-compatible Interface CCA have no capability for detecting a parity error. Characters transmitted with a parity error are printed to their nearest ASCII approximation.

When this option is disabled and the printer is configured with either a Short-line or Long-line Parallel Interface CCA, the parity error bit is ignored. When this option is disabled and the printer is configured with a Serial Interface CCA, the user must not transmit the parity bit. If one is transmitted, it is construed by the printer as a framing or overrun error, and the character in which the parity bit appears is printed as a question mark (?).

e. Parity Odd/Even

With this option enabled, and provided that the parity error detect option is enabled, the printer will check the user data for odd parity. With this option disabled, and with the parity error detect option enabled, the printer will check the user data for even parity.

f. Serial Interface Don't Care Parity

In printers configured with a late-model Serial Interface CCA, "Dont Care" has been added to the list of available parity modes (odd even, w/o, don't care). To configure the don't care parity mode, a jumper is connected between pins 6 and 11 of J15, and no jumper is connected between pins 4 and 13 of J15. See table 6-1A for details.

g. 11/12 Inch Forms Length

The standard forms length is 11 inches. When this option is enabled, the printer will accept a 12-inch form. Note that, if the printer is configured with the FORM LENGTH SELECT switch option, forms length is determined by the setting of that switch. If either the TCVFU or DAVFU option is installed, forms length is determined by the VFU pattern. If the printer is configured with either the DAVFU or TCVFU option, but the VFU memory is not loaded, forms length is determined first by the setting of the FORM LENGTH SELECT switch. If that switch is not installed, forms length is determined by this option.

h. Automatic Line Feed

With this option enabled and the printer configured with either a Long-line or Serial Interface CCA, the printer will generate a line feed automatically upon receipt of a carriage return code (Hex OD). With this option enabled and the printer configured with either a Short-line or DPC Centronics-compatible Interface CCA, automatic line feed must, in addition, be configured by the appropriate parameter switches (see section IV).

On printers shipped prior to November 21, 1979, back-to-back carriage return codes with auto line feed enabled, will result in successive line feeds. Printers shipped after November 21, 1979 require data to precede each carriage return code. Carriage return codes not preceded by data when auto line feed is enabled are ignored.

i. Seven Bit Word Length

With this option enabled, the printer will only sample the seven least significant data bits. When configured with a Serial Interface CCA, the printer will sample only the first seven data bits.

6.2.2 Header Preparation

As shown in figure 6-1, there are two option headers, marked A/J14 and B/J15, respectively. Each option header is a connector mounted on the Mother Board, and is fitted with a male plug. Each plug has a total of 16 connector pins arranged in two rows and labelled 1 through 16. To enable an option, a jumper is connected between the applicable connector pin in one row and its opposite number in the other row. Table 6-1 defines the function of each connector pin pair.

NOTE

In some model printers, the option header is replaced by DIP switches. Each switch is a direct replacement for a connector pin pair on the option header. Placing a switch to the on position is equivalent to installing a jumper on the option header; placing a switch to the off position is equivalent to removing a jumper on the option header.

6.2.2 Header Preparation

As shown in figure 6-1, there are two option headers, marked A/J14 and B/J15, respectively. Each option header is a connector mounted on the Mother Board, and is fitted with a male plug. Each plug has a total of 16 connector pins arranged in two rows and labelled 1 through 16. To enable an option, a jumper is connected between the applicable connector pin in one row and its opposite number in the other row. Table 6-1 defines the function of each connector pin pair. Table 6-1A defines the pin pair combinations used to select the serial interface parity modes.

NOTE

In some model printers, the option header is replaced by DIP switches. Each switch is a direct replacement for a connector pin pair on the option header. Placing a switch to the on position is equivalent to installing a jumper on the option header; placing a switch to the off position is equivalent to removing a jumper from the option header.

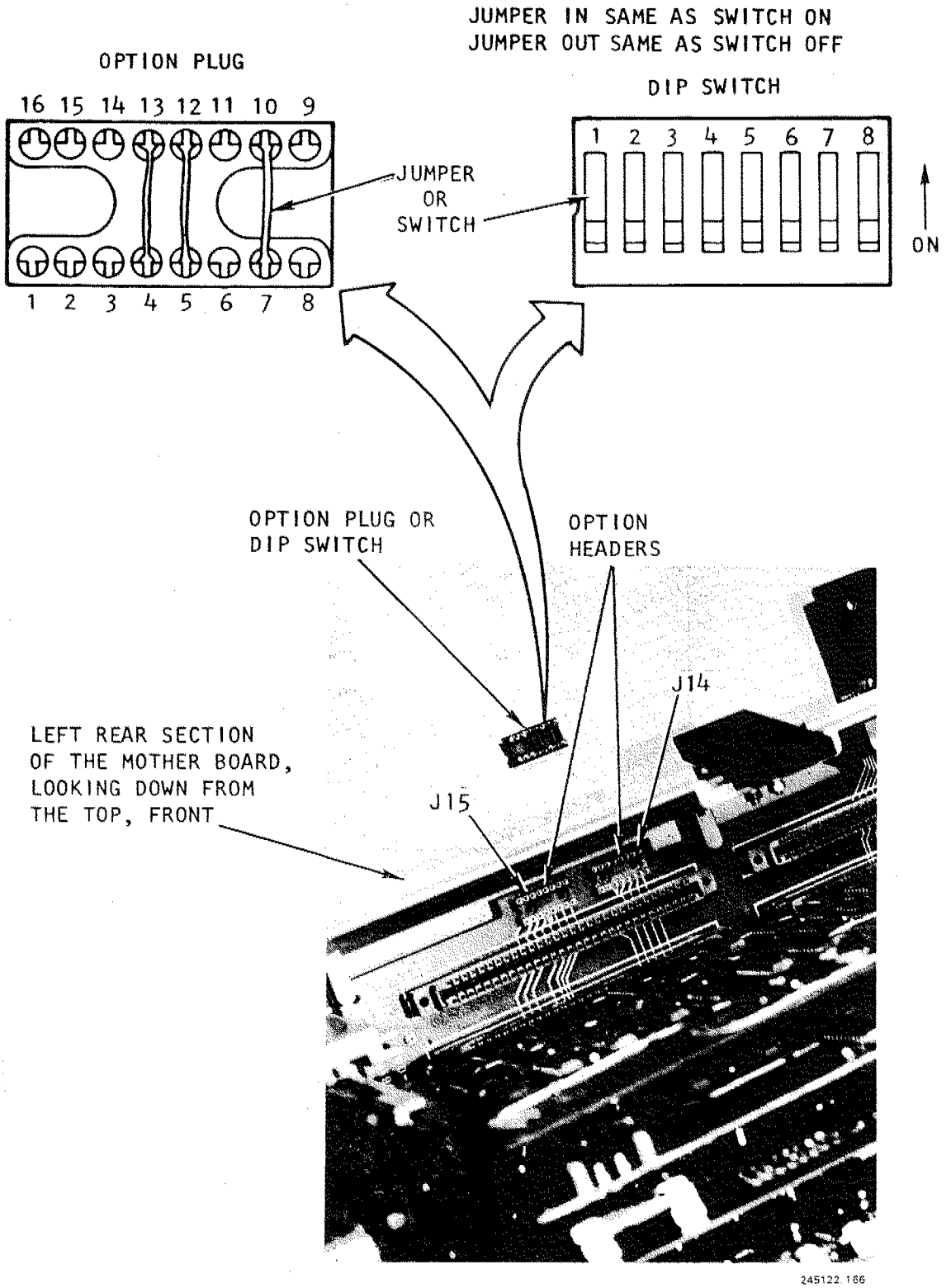


Figure 6-1. Option Header and Option Plug (or Dip Switch) Locations

TABLE 6-1. OPTION HEADER PIN ASSIGNMENTS

Option Plug Pins				Function
B/J15	1	o o	16	Perf. Skip 1*
	2	o o	15	Fixed form length select Jumper in, 12 in. Jumper out, 11 in.
	3	o o	14	7-Bit only, with jumper in; 8 bits, with jumper removed
	4	o o	13	Parity Enable
	5	o o	12	Auto Line Feed
	6	o o	11	Odd/Even Parity, Jumper in, odd parity, Jumper out, even parity
	7	o o	10	Perf. Skip 2**
	8	o o	9	(Spare)
A/J14	1	o o	16	(Spare)
	2	o o	15	(Spare)
	3	o o	14	(Spare)
	4	o o	13	Condensed Print
	5	o o	12	DAVFU
	6	o o	11	(Spare)
	7	o o	10	TCVFU
	8	o o	9	(Spare)

* Number of perforation skip lines is selected by the bit configuration of Skip 1 and Skip 2, as follows:

0 = jumper out
1 = jumper in

Perf Skip 1 J15-1/16	Perf Skip 2 J15-7/10	Lines Skipped
0	0	3
0	1	4
1	0	6
1	1	0

TABLE 6-1A. SERIAL INTERFACE PARITY SETTINGS

J15 Jumper 4 to 13	J15 Jumper 6 to 11	Parity
Installed	Installed	Odd
Installed	Cut	Even
Cut	Installed	Don't Care
Cut	Cut	Without Parity

6.3 TCVFU TAPE PREPARATION AND LOADING

6.3.1 Introduction

The following information applies to printers equipped with the optional Tape Controlled Vertical Format Unit (TCVFU).

The printer uses an optical tape reader and punched tape loop to control vertical paper movement and produce particular print formats. When instructed, the printer can select information from one of 12 user-programmed format channels located on the punched tape loop. A channel is a numbered vertical column on the tape loop, and the arrangement of the punched holes in the column determines the fixed formats. The tape loop is representative of the paper form used by the printer and contains selectable bit positions for each line on the form. Each tape loop has 12 vertical columns and can be made to produce up to 12 fixed formats. Figure 6-2 illustrates the relationship between the sprocket-driven tape and the lines on a representative 66-line print form. Each sprocket hole on the tape represents one line of the form. Thus, for a standard 11-inch form with 6 lines per inch spacing, 66 sprocket holes define one form length of the tape.

Tape loop preparation consists of planning and punching the tape according to the desired control program, and then splicing the tape together.

a. Tape Planning

Since each sprocket hole corresponds to one line of print, the tape should be as long as, or have as many sprocket holes as the length of the form times the number of lines per inch to be printed.

Example:

11 inch form x 6 lines per inch = 66 sprocket holes.

11 inch form x 8 lines per inch = 8 sprocket holes.

Only one hole may be punched in channel 1, as it is used exclusively for top of form sensing. Channels 2 through 11 may be punched in any manner to meet program requirements. Channel 12 is used for bottom of form sensing in addition to specific program requirements. When a hole in channel 12 is sensed, paper will advance automatically until a hole in channel 1 (top of form) is sensed. Note that for all tape preparation operations, the punch hole for top of form may be punched on any print form line at the intersection of channel 1. Once channel 1 is identified, all other channel/print form line intersections are then relative to the channel 1 punch hole. If the complete program is less than 66 sprocket holes in length, the entire program must be repeated as often as necessary until at least 66 lines or sprocket holes are used. If at all possible, the program should be planned so that perforations are not punched in the area of the splice.

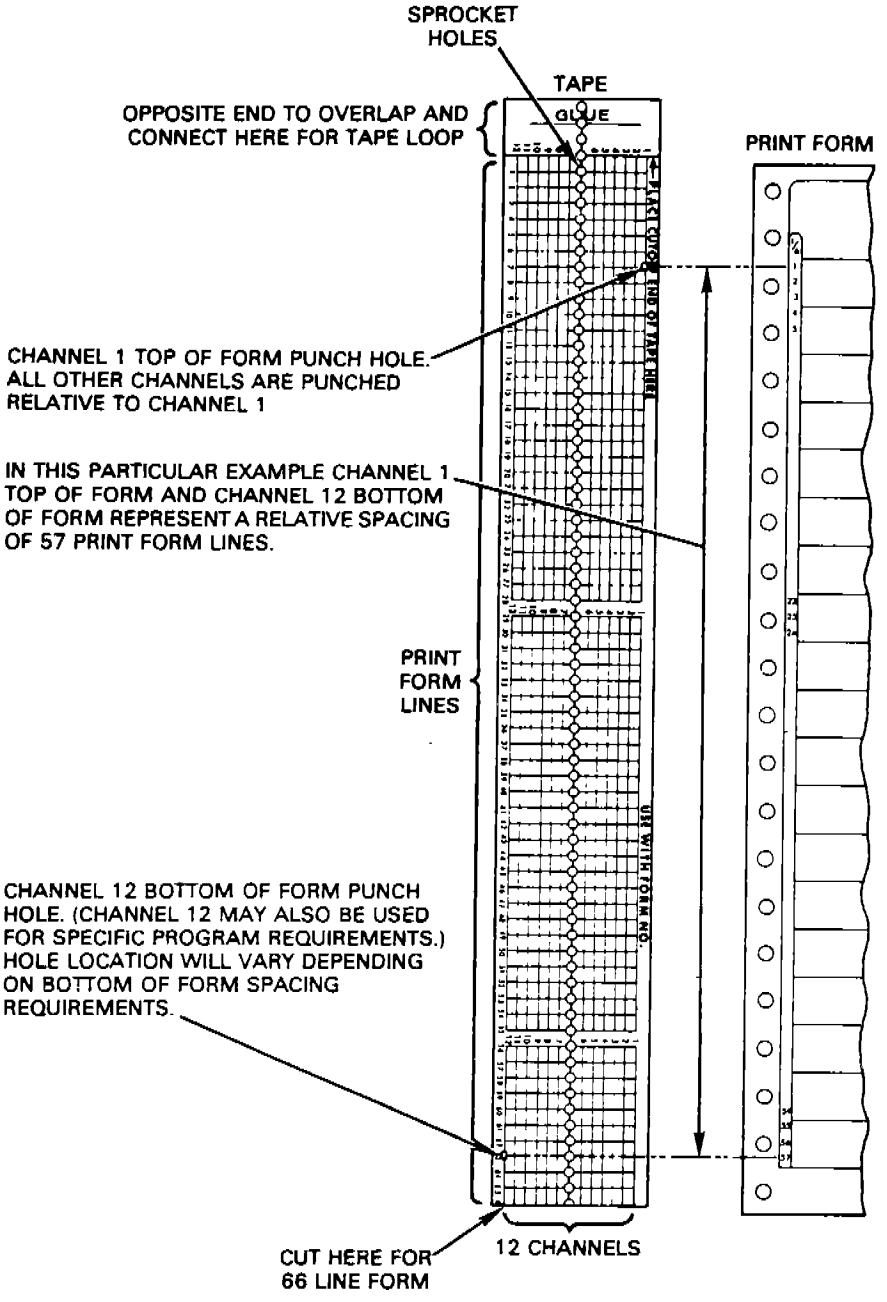
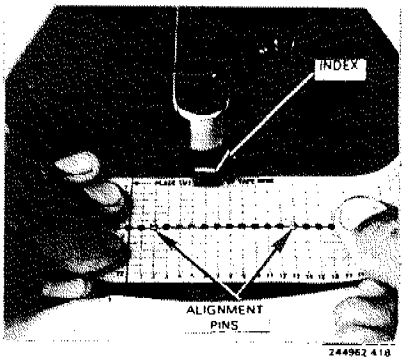


Figure 6-2. Tape-to-Form Relationship(6LPI)

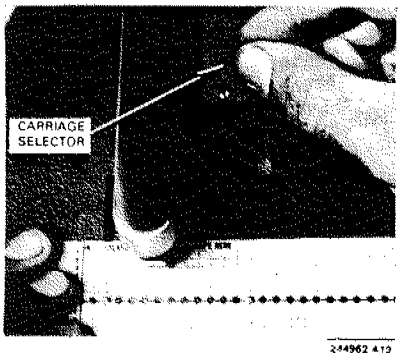
b. Tape Punching

Equipment required in this procedure includes a 12-channel tape punch, DPC P/N 801313-001, 12-channel paper tape, DPC P/N 800958-012, and a pair of scissors. Proceed as follows:

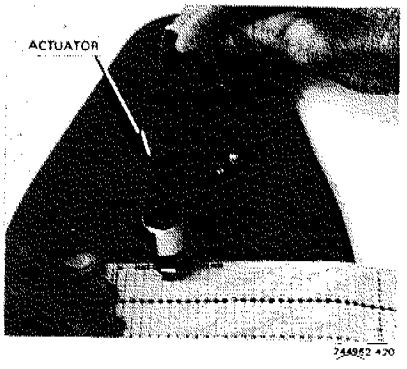
1. Position the tape sprocket holes over the punch alignment pins in order to align the desired print form line (numbered sequentially from 1 to 140) to the punch mechanism's index.



2. Position the carriage selector on the punch to the appropriate channel.



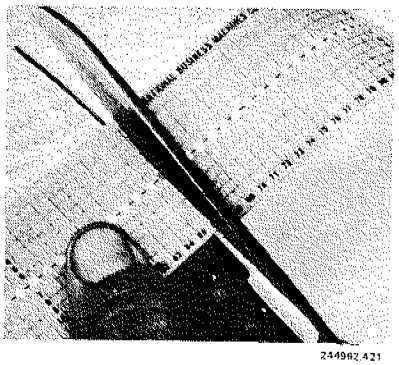
3. Push the punch actuator.



NOTE

Repeat steps 1 through 3 until the entire program has been punched on the tape. The tape program should be a minimum of 66 sprocket holes and a maximum of 145 (not counting 3 sprocket holes for a splice overlap). If the tape program is less than 66 sprocket holes, repeat the entire program enough times until the minimum requirement is met.

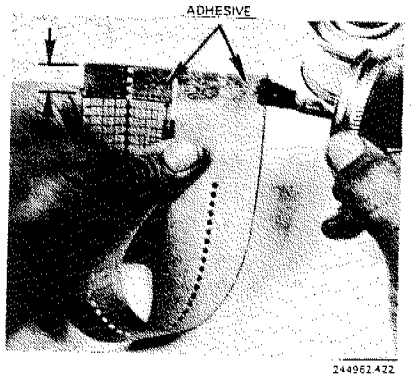
4. With a scissors, cut the tape through the center of the sprocket hole that corresponds to the last print form line. Proceed to "Tape Splicing", as shown.



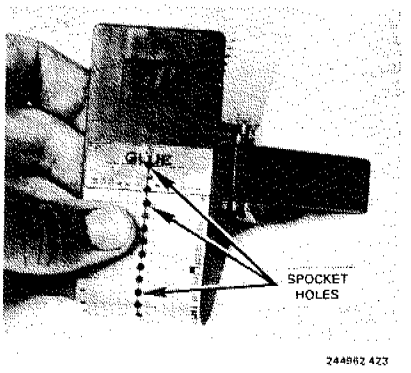
c. Tape Splicing

Equipment required for this procedure includes a Splicing Guide (DPC P/N 241512) and adhesive (DPC P/N 800962-002). Proceed as follows:

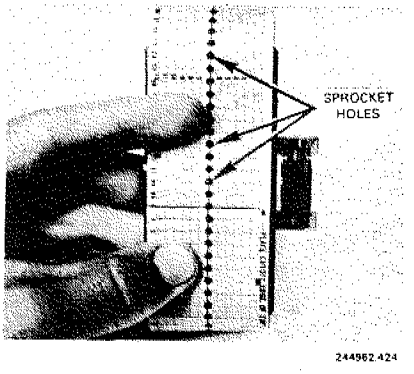
1. Apply a thin coat of adhesive to the ends of the tape and allow it to dry until tacky.



2. Place the "glue" end of the tape in the splicing guide and engage the second, fifth, and twelfth sprocket holes, as shown.



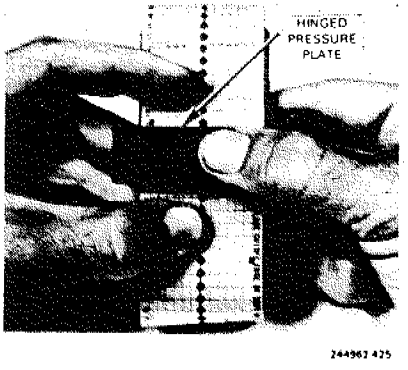
3. Place the other end of the tape in the splicing guide, carefully placing the glued ends on top of each other and assurring that the second, fifth, and twelfth full sprocket holes are aligned.



4. Close the hinged pressure plate and apply finger pressure for approximately 30 seconds. After 30 seconds, remove the tape.

NOTE

After each use, remove the adhesive from the tape splicing guide to prevent a build-up.



d. Tape Loading

Refer to figure 6-3 and proceed as follows:

1. Orient the tape so that channel 12 is on the inside (toward the rear of the printer) and channel 1 is on the outside.

2. Place the bottom of the tape loop within the reader gap, then wrap the tape loop over the pulley and tensioner. Be sure that the pulley sprockets are seated firmly within the sprocket holes of the tape loop.

3. Remove the slack from the tape loop by moving the tensioner within the slot to the right.

4. Place the printer POWER switch to the ON position.

Data is read from tape during a "Load Tape" mode and stored in memory. The "Load Tape" operation is initiated by the operator pressing the reader switch located on the tape reader assembly, when the printer is in the off line mode. VFU memory loading must take place on printer power up, following any tape change, or following the detection of a VFU error. The memory load starts when a hole in channel 1 is detected, and continues until a hole in channel 1 is again detected. The end of the operation is indicated by the tape coming to a stop. Once the memory has been loaded, the reader turns off, and all mechanical activity ceases. If an error occurs while loading the tape, the alarm light will illuminate. To recover, the clear button must be pressed and the load operation must be repeated. Pressing the CLEAR switch will not clear VFU "Memory".

6.3.2 TCVFU Access

There are three types of format commands recognized by the printer: ASCII-coded format commands, tape channel format commands, and line step format commands.

a. ASCII-Coded Format Commands

1. Form Feed - Hex 14

2. Line Feed - Hex 12

3. Carriage Return - Hex 15

b. Tape Channel Format Commands

The tape channel format commands cause paper to advance until the designated tape channel number is encountered, and then to stop. Tables 6-2 and 6-3, respectively, list the tape channel commands for printers configured with any Parallel Interface CCA, and for printers configured with a Serial Interface CCA.

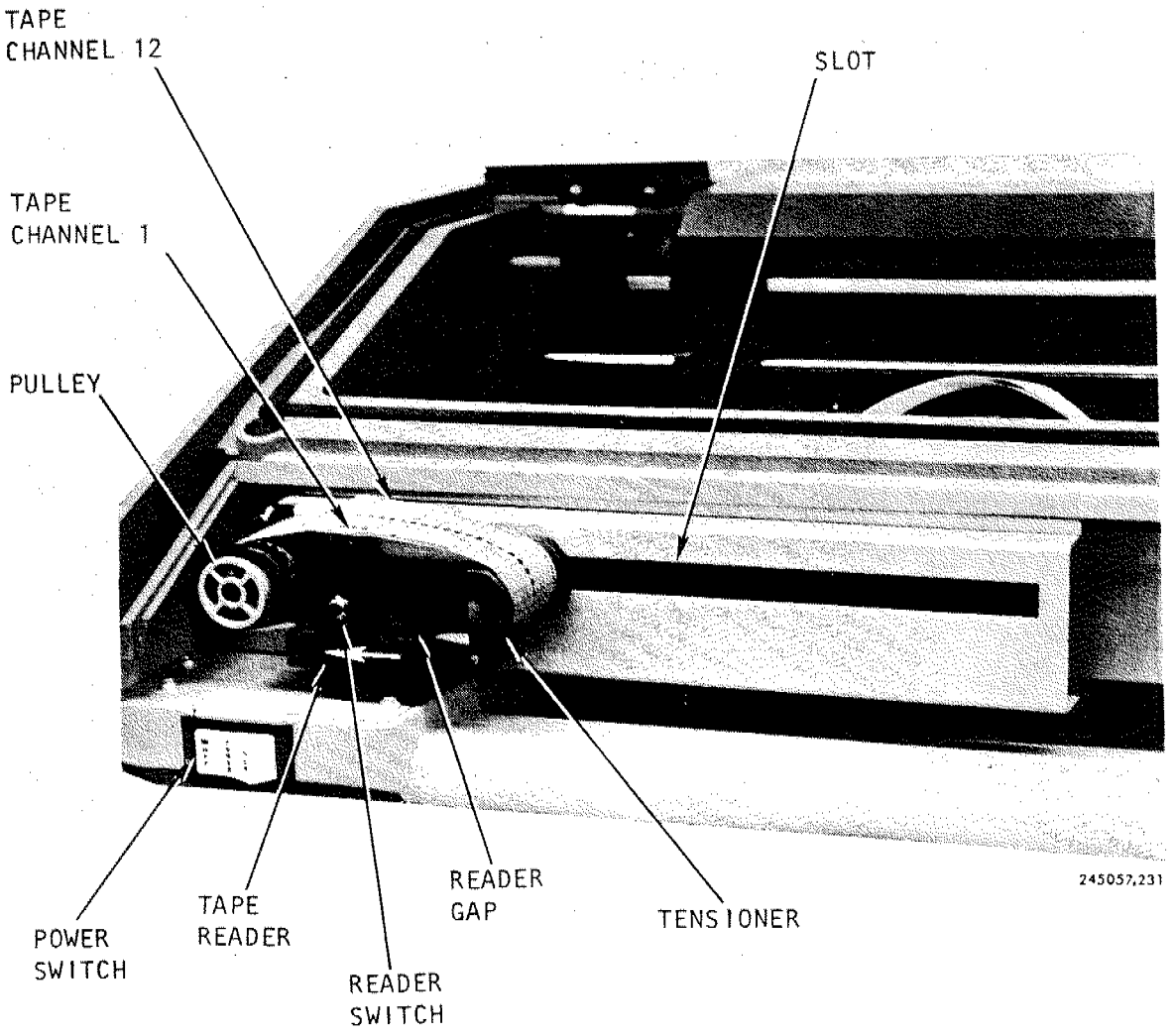


Figure 6-3. TCVFU Tape Loading

c. Line Step Format Commands

The line step format commands cause paper to slew a specified number of lines from 0 to 15, then stop.

TAPE 6-2. PARALLEL TAPE CHANNEL FORMAT COMMANDS

PI	Data Bits								Channel
	8	7	6	5	4	3	2	1	
1	0	0	0	0	0	0	0	0	1
1	0	0	0	0	0	0	0	1	2
1	0	0	0	0	0	0	1	0	3
1	0	0	0	0	0	0	1	1	4
1	0	0	0	0	0	1	0	0	5
1	0	0	0	0	0	1	0	1	6
1	0	0	0	0	0	1	1	0	7
1	0	0	0	0	0	1	1	1	8
1	0	0	0	0	1	0	0	0	9
1	0	0	0	0	1	0	0	1	10
1	0	0	0	0	1	0	1	0	11
1	0	0	0	0	1	0	1	1	12

TABLE 6-3. SERIAL INTERFACE TAPE CHANNEL FORMAT COMMANDS

Data Bits								Channel
8	7	6	5	4	3	2	1	
1	0	0	0	0	0	0	0	1
1	0	0	0	0	0	0	1	2
1	0	0	0	0	0	1	0	3
1	0	0	0	0	0	1	1	4
1	0	0	0	0	1	0	0	5
1	0	0	0	0	1	0	1	6
1	0	0	0	0	1	1	0	7
1	0	0	0	0	1	1	1	8
1	0	0	0	1	0	0	0	9
1	0	0	0	1	0	0	1	10
1	0	0	0	1	0	1	0	11
1	0	0	0	1	0	1	1	12

Note: Bit 8 corresponds to the PI line.

TABLE 6-4. PARALLEL INTERFACE LINE STEP FORMAT COMMANDS

PI	Data Bits								Line Step
	8	7	6	5	4	3	2	1	
1	0	0	0	1	0	0	0	0	0
1	0	0	0	1	0	0	0	1	1
1	0	0	0	1	0	0	1	0	2
1	0	0	0	1	0	0	1	1	3
1	0	0	0	1	0	1	0	0	4
1	0	0	0	1	0	1	0	1	5
1	0	0	0	1	0	1	1	0	6
1	0	0	0	1	0	1	1	1	7
1	0	0	0	1	1	0	0	0	8
1	0	0	0	1	1	0	0	1	9
1	0	0	0	1	1	0	1	0	10
1	0	0	0	1	1	0	1	1	11
1	0	0	0	1	1	1	0	0	12
1	0	0	0	1	1	1	0	1	13
1	0	0	0	1	1	1	1	0	14
1	0	0	0	1	1	1	1	1	15

TABLE 6-5. SERIAL INTERFACE LINE STEP FORMAT COMMANDS

Data Bits								Line Step
8	7	6	5	4	3	2	1	
1	0	0	1	0	0	0	0	0
1	0	0	1	0	0	0	1	1
1	0	0	1	0	0	1	0	2
1	0	0	1	0	0	1	1	3
1	0	0	1	0	1	0	0	4
1	0	0	1	0	1	0	1	5
1	0	0	1	0	1	1	0	6
1	0	0	1	0	1	1	1	7
1	0	0	1	1	0	0	0	8
1	0	0	1	1	0	0	1	9
1	0	0	1	1	0	1	0	10
1	0	0	1	1	0	1	1	11
1	0	0	1	1	1	0	0	12
1	0	0	1	1	1	0	1	13
1	0	0	1	1	1	1	0	14
1	0	0	1	1	1	1	1	15

Note: Bit 8 corresponds to the PI line.

6.4 DAVFU LOADING

The following information applies to printers configured with the optional Direct Access Vertical Format Unit (DAVFU).

DAVFU is a means for loading vertical format information directly into memory, replacing the punched tape loop and reader of a TCVFU. Format information is transmitted by the user over the data bus normally reserved for print and paper motion information.

To start a DAVFU load operation, the user first transmits a DAVFU start code (6E Hex) and P.I. This causes the printer to treat the subsequent characters as VFU channel codes, and store them in appropriate memory locations reserved for VFU data. Once the number of VFU codes corresponding to the length of the form (252 lines maximum) has been loaded, the user transmits a VFU stop code (6F Hex) and P.I. This causes the printer to revert to the normal mode and once again treat data as print and paper motion characters.

Each VFU code consists of 12 bits, equivalent to the 12 channels on the tape. Since the standard interface data bus is only eight bits wide, it takes two bytes to transmit all 12 bits of a VFU code; the first (odd) byte contains information for channels 1 through 6, and the second (even) byte for channels 7 through 12. For this reason, the number of bytes transmitted during any DAVFU load operation must always be even; an odd number of bytes is construed as a DAVFU error.

Table 6-6 shows the bit assignments associated with a DAVFU format word. Data bits 1 through 6 of the first byte correspond to tape channels 1 through 6, while data bits 1 through 6 of the second byte correspond to tape channels 7 through 12. Data bits 7 and 8 of both bytes have no significance and are always in the logical "0" state.

TABLE 6-6. DAVFU FORMAT DATA BIT ASSIGNMENTS

Bit	Significance	Remarks
PI*	Paper Instruction	
8*	None	
7	None	
6	Channel 6	First (Odd) Byte
5	Channel 5	
4	Channel 4	
3	Channel 3	
2	Channel 2	
1	Channel 1 (Top of Form)	
PI*	Paper Instruction	
8*	None	
7	None	
6	Channel 12 (Bottom of Form)	Second (Even) Byte
5	Channel 11	
4	Channel 10	
3	Channel 9	
2	Channel 8	
1	Channel 7	

* Note: In printers configured with a Serial Interface CCA, PI is omitted and its function assumed by bit 8.

As an example, assume that the user intends to "punch holes" in tape channels 4, 5, 6, and 7. Accordingly, the two bytes will have the following bit configuration:

PI*	Bit 8*	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	
0	0	0	1	1	1	0	0	0	First Byte
0	0	0	0	0	0	0	0	1	Second Byte

* Note: In printers configured with a Serial Interface CCA, PI is omitted and its function assumed by bit 8.

6.5 DAVFU ACCESS

Once the VFU memory has been loaded via the interface lines, DAVFU-controlled paper motion instructions are identical to those of the TCVFU described in paragraph 6.3.2.

6.6 TCVFU/DAVFU DEFAULT CONDITIONS

TCVFU/DAVFU default conditions are as follows:

a. A non-ASCII format code (tape channel select or line step code) received before the VFU memory is loaded, will default to a line feed (LF).

b. A tape channel select code which directs the printer to slew to a tape channel that has no channel stop (channel not previously defined by punching the tape or loading memory) will default to a single line feed.

c. If neither TCVFU nor DAVFU is installed, the paper instruction (PI) bit will be ignored, and the printer will interpret the data bus as 8-bit ASCII codes.

d. If both TCVFU and DAVFU options are installed, the vertical format information most recently loaded will take priority.

e. If the vertical pitch switch is changed, 6 LPI to 8 LPI or 8 LPI to 6 LPI, the top of form position will be reinitialized.

f. If either the TCVFU or DAVFU is loaded, FLS and perforation skip-over are disabled.

g. If TCVFU and/or DAVFU are installed but neither option is loaded, the printer will respond to non-ASCII vertical format commands by defaulting those codes to line feeds (LF).

SECTION VII

PRINTER DIAGNOSTICS

7.1 INTRODUCTION

This section contains information used for analyzing typical printer malfunctions, and for isolating these malfunctions to one or more possible causes. Also included are a flow chart and procedure for testing printer operation, and a table that defines each state of the numerical status display.

7.2 PRINTER CHECKOUT

Figure 7-1 is a flow chart illustrating the checkout procedure recommended for testing the printer for paper operation.

7.3 STATUS DISPLAY DEFINITIONS

The status display serves as an aide to the operator when troubleshooting the printer; it indicates which major function was being performed when the printer malfunctioned. Table 7-1 defines the printer status associated with each two-digit numerical display.

TABLE 7-1. STATUS DISPLAY DEFINITIONS

Number	Definition	Corrective Action	Clear By
00	Switch check routine/ready	Waiting for control panel instruction	
01	Out of paper	Reload Paper	1 2
03	Cover open	Close top cover	1 2
04	Bail open	Position platen gap lever to closed position	1 2
09	No tape-tape reader jammed	Install tape or eliminate cause of binding	1 2
12	No TOP OF FORM on tape	Verify tape is punched correctly and install	1 2

TABLE 7-1. STATUS DISPLAY DEFINITIONS (Contd)

Number	Definition	Corrective Action	Clear By	
13	Vertical format unit memory capacity exceeded	Assure that form length does not exceed allowable capacity. Then reload memory	1	2
26	DAVFU fault	Call service personnel	2	
40	Print right normal	Call service personnel	2	
41	Print left normal	Call service personnel	2	
42	Print right compressed	Call service personnel	2	
43	Print left compressed	Call service personnel	2	
44	Print right expanded	Call service personnel	2	
45	Print left expanded	Call service personnel	2	
48	TCVFU load routine	Verify tape is correct, install, and reload	1	2
50	Position seek	Call service personnel	2	
52	Shuttle park	Call service personnel	2	
54	Initialize routine	Call service personnel	2	
55	Form feed routine	Call service personnel	2	
56	8 Lines per inch routine	Call service personnel	2	
57	8 lines per inch routine	Call service personnel	2	
58	Step routine	Call service personnel	2	
62	Printer waiting for data	Load operation incomplete		
63	Buffer interrogate	Call service personnel	2	
64	No shuttle motion	Verify shuttle mechanism is not binding	2	
65	No interface card	Call service personnel	2	
66	No clear to alarm C/R flip-flop	Call service personnel	2	
67	Self test	Switch test switch to off	2	

1 Press ALARM/CLEAR SWITCH
2 Shut down and power up

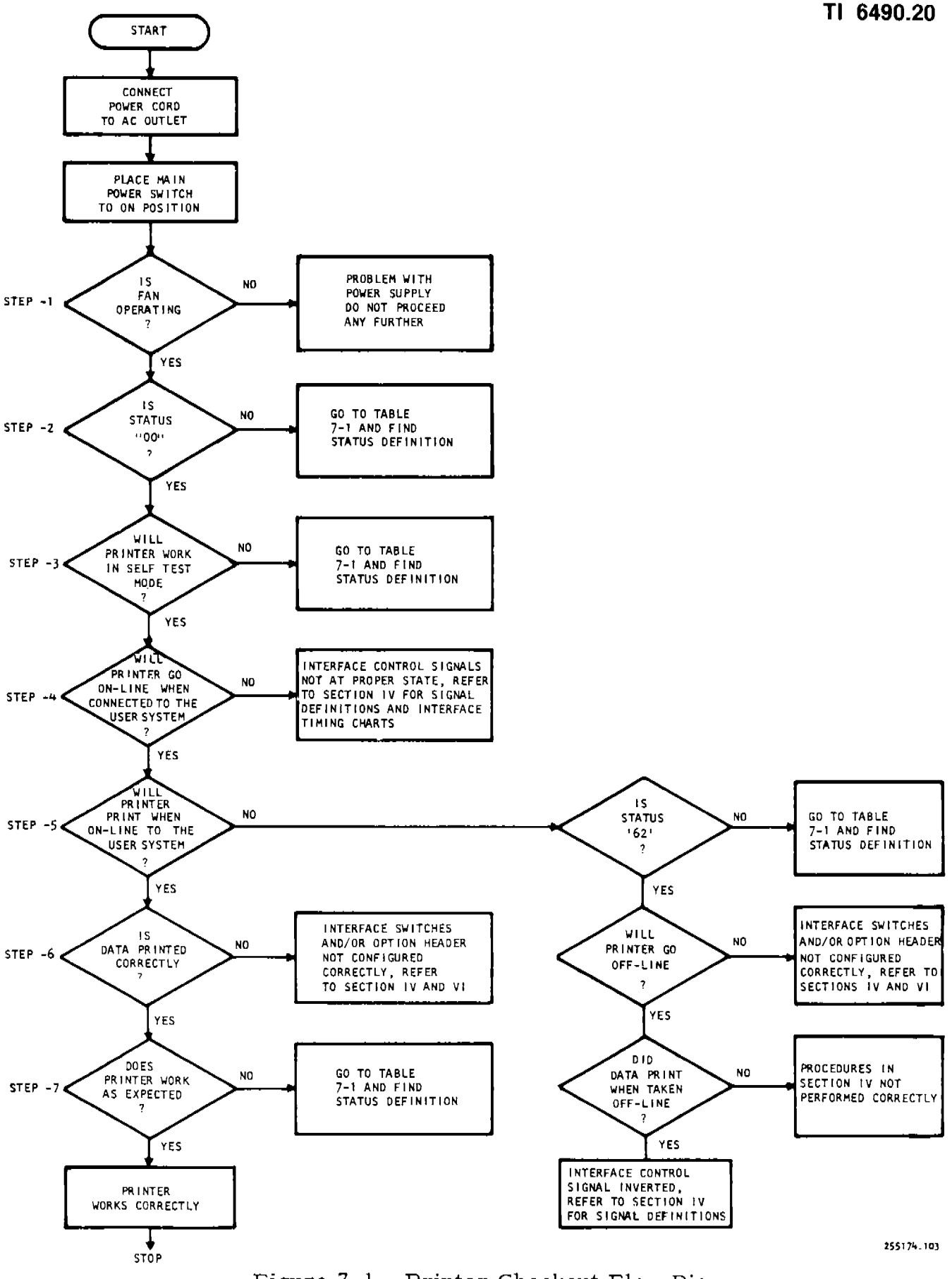


Figure 7-1. Printer Checkout Flow Diagram

7.4 FAULT ISOLATION CHART

Table 7-2 lists typical malfunctions that may be encountered by the operator, and one or more probable causes associated with each malfunction.

TABLE 7-2. FAULT ISOLATION CHART

Fault Symptom	Probable Cause
Print density not uniform.	a. Wire Driver ON/OFF period misadjusted. b. Forms thickness setting does not match form. c. Wire Driver current misadjusted. d. Wire Driver CCA A5 defective. e. Processor CCA A3 defective.
Print line is skewed.	Tractor phasing incorrect.
Print rate too slow.	a. Shuttle speed on Motor Driver CCA misadjusted. b. Excessive shuttle friction.
Carriage does not move or moves erratically.	a. Mechanical interference such as paper jam. b. Idler pulley misadjusted. c. Push-on terminals to shuttle servo motor disconnected.
When PAPER STEP switch is pressed and released, paper advances continuously.	a. PAPER STEP switch defective. b. Motor Driver CCA A4 defective. c. FORM LENGTH switch option improperly set. d. Paper feed belt broken. e. TCV FU improperly loaded. f. Tape reader defective. g. VFU tape defective.
Printer continues printing after paper supply has been exhausted.	Paper low interlock switch misadjusted or defective.
Dots missing from printed character.	a. Worn ribbon b. FORMS THICKNESS control setting does not match forms thickness. c. Wire driver ON/OFF period misadjusted. d. Any one of fuses A4F1 through A5F1 on Wire Driver CCA defective. e. Wire Driver CCA A5 defective. f. Print head defective. g. Processor CCA A3 defective. h. Defective print head flex cable.

TABLE 7-2. FAULT ISOLATION CHART (Contd)

Fault Symptom	Probable Cause
Margin alignment inconsistant, or non-uniform	a. Loose shuttle servo belt. b. Loose pulley on shuttle servo motor. c. Column 1 harness loose. d. Flange on carriage loose. e. Forms thickness control does not match form thickness. f. Processor CCA A3 defective. g. Defective shuttle servo motor.
Print head overshoots left or right margin.	a. Column 1 harness misadjusted. b. A4F3 fuse defective (right overshoot). c. A4F4 fuse defective (left overshoot). d. Column 1 harness defective. e. -21 volt power absent (left overshoot). f. +21 volt power absent (right overshoot). g. Shuttle servo motor defective. h. Motor Driver CCA A4 defective. i. Processor CCA A3 defective.
In self test mode, paper does not advance after each line of print (overprint)	Processor CCA A3 defective
With printer on line, and interface connected, paper advances incorrect number of lines.	a. Interface CCA A2 defective. b. Processor CCA A3 defective. c. Interface switches and option header not configured correctly.
Ribbon is not advancing.	a. Ribbon cassette improperly installed or defective. b. Motor Driver CCA defective. c. Processor CCA defective.
Paper does not advance when top of form switch is pressed.	a. Control panel switch defective. b. Control panel CCA defective. c. Processor CCA defective.
Paper does not advance when paper step switch is pressed.	a. Control panel switch defective. b. Control panel CCA defective. c. Processor CCA defective. d. Motor Driver CCA defective.
Paper does not advance under under any condition.	a. Paper feed belt broken. b. Tractor drive assembly binding or defective. c. Motor Driver CCA defective.

TRAINING INFORMATION

DATAPRODUCTS HAS A TRAINING COURSE AVAILABLE TO MEET YOUR EDUCATIONAL NEEDS.

The M120/M200 Printer Training Course is a 5-day analysis of the M-Series printers, ideal for teachers, engineers, support personnel, or others requiring an in-depth understanding of printer technology. Regularly scheduled classes are conducted in Woodland Hills, California. Special classes may be conducted at your facility.

For registration information, contact:

THE DATAPRODUCTS TECHNICAL EDUCATION CENTER

Telephone: (213) 887-8489

Telex: 69-8492

☆U. S. GOVERNMENT PRINTING OFFICE : 1986 O - 496-175